THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVI. No. 1427.] LONDON, SEPTEMBER 16, 1890. [42ND YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.

Guaranteed Free from Adulteration. **TORBAY PAINTS.**

FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints"

As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.

Illustrated Price List Post Free.

TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 620.

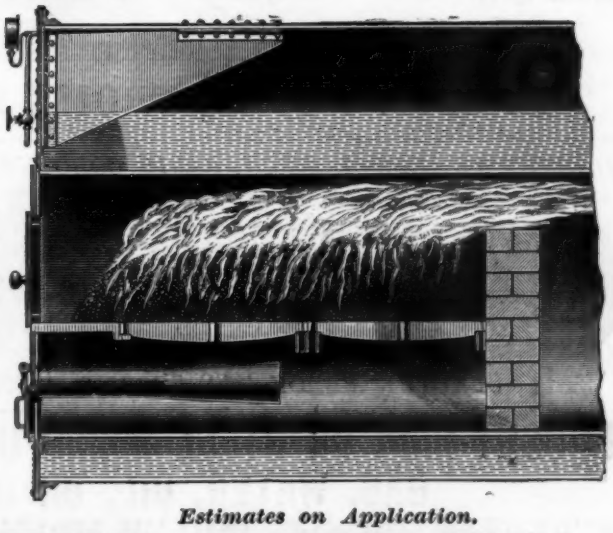
CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.

Office: 7, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

J. UNGAR & CO.,
Manufacturers & Patentees of every Description of
IMPROVED LAMPS
FOR
Streets, Markets, Shops, &c.
WHOLESALE DEPOT: 52, COMMERCIAL ST., LONDON, E.
We specially solicit Government and Local Board Contracts for General Lighting.

SELF-CONTAINED DUST FUEL FURNACE.



150 SOLD.

Estimates on Application.

MELDRUM BROS.,
26, HALF STREET, CATHEDRAL YARD, MANCHESTER.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765),

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

TELEGRAPHIC ADDRESS: 'COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers and Contractors for the Erection of Gas-Works.

MANUFACTURERS OF IMPROVED GAS-EXHAUSTING APPARATUS.

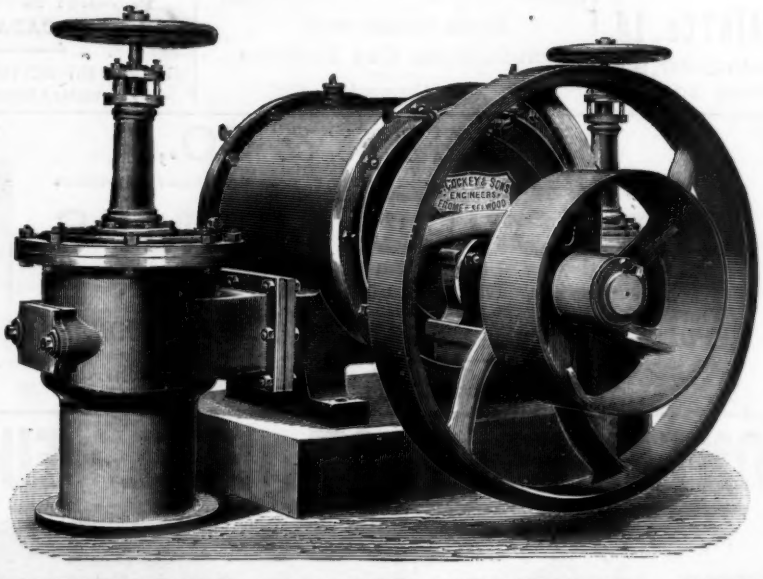
A Large Stock of Valves always on hand.

Lamp Columns; various patterns.

Wood Grids for Purifiers and Scrubbers.

Castings of every description.

Apparatus for the manufacture of Sulphate of Ammonia.



Experienced Retort-Setters constantly employed.

Lead Burning and Plumbing in all its Branches.

Gas-Fittings in great variety.

Brass Castings.

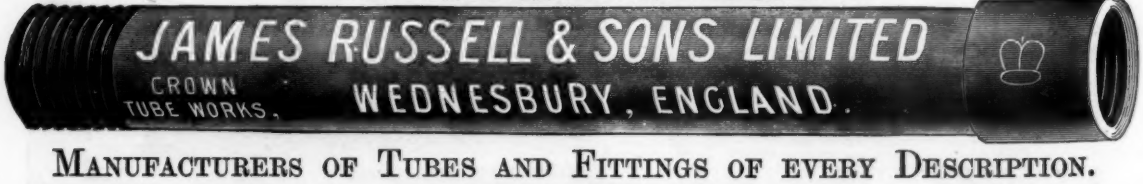
Patent Washers and Valves.

Boilers and Engines.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOS. PIGGOTT & CO., ATLAS WORKS, BIRMINGHAM.

WELDED AND RIVETTED PIPES FROM 8-INCHES DIA. UPWARDS.

PIGGOTT'S PATENT SOCKET. SINGLE SOCKET. KIMBERLEY SOCKET.

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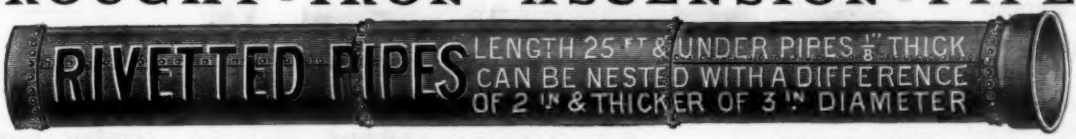


LONDON OFFICE: 14, ST. THOMAS APOSTLE, E.C. Telegraphic Address: "ATLAS BIRMINGHAM."

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION, OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description.

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

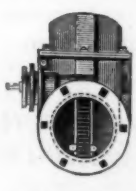
WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS,

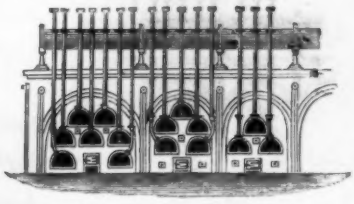
TAR AND LIQUOR PUMPS, &c.

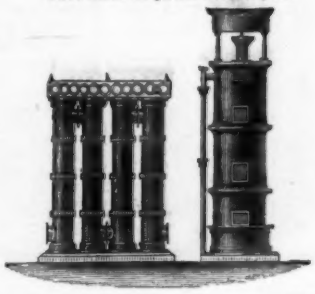
PATENT CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.





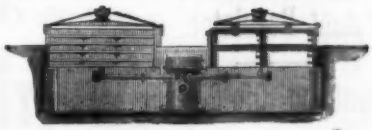


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

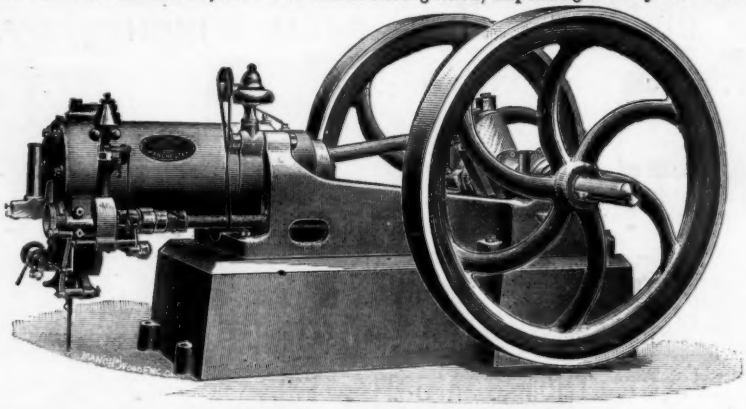
100 Prize Medals.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.

MADE in SIZES
2-Man to 100-HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY
SEWAGE, &c., &c.

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.



MADE in SIZES
2-Man to 100-HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS, &c., &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING,
&c., &c.

Over 31,000 "OTTO" ENGINES are at work.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

LONDON,
LIVERPOOL,
GLASGOW,
NEWCASTLE,
BIRMINGHAM,
HULL.

HARRIS & PEARSON,
STOURBRIDGE, ENGLAND.
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.

W. C. HOLMES & CO.,

CONTRACTING GAS ENGINEERS.

SPECIALITIES.

Patent Regenerative Retort-Settings.

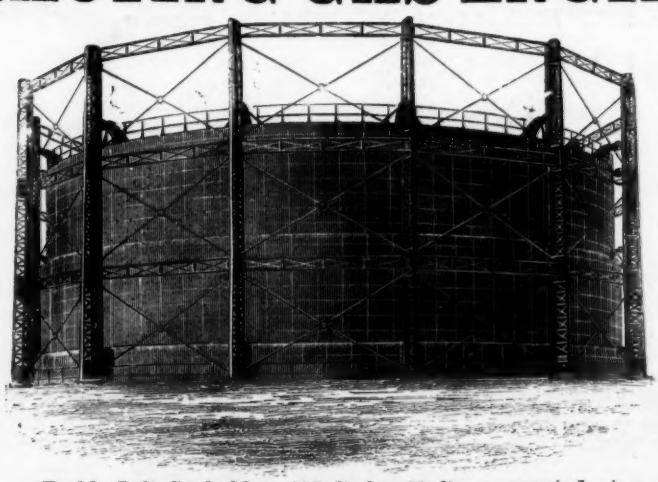
Patent Rotary Scrubber-Washer.

Patent Reciprocating Exhauster.

Patent Regulator.

Patent Anti-Dip Pipes.

Telegrams:
"Holmes Huddersfield."
"Ignitor London."



Treble-Lift Gasholder, 130 ft. by 66 ft., as erected at Burton-on-Trent, 1889.

WHITESTONE IRON-WORKS,
HUDDERSFIELD,
AND
80, CANNON STREET, LONDON, E.C.

SOLE MAKERS OF
DRAKE'S
PATENT
GAS PLANT
Specially adapted for Country Places, and for mixing with Coal Gas to increase Illuminating Power.

Condensers, Scrubbers, Purifiers, and all Fittings for Gas-Works.

IMPROVED
CHEMICAL PLANT.

Illustrated Catalogues on application.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

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TRADE	TELEGRAMS:	LONDON AGENTS:
C X C	"JACKSON"	BECK & Co.
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Fye Bridge.

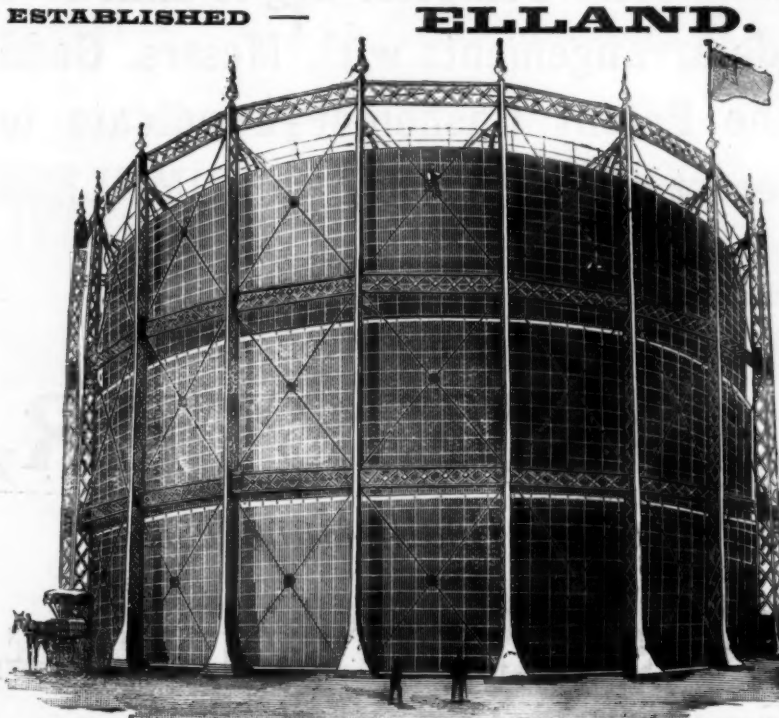
And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

R. DEMPSTER & SONS, Ltd.,

ROSE MOUNT GAS ENGINEERING WORKS,

ESTABLISHED — ELLAND. — 1855.



The above illustrates a TREBLE-LIFT GASHOLDER, 194, 191, and 188 feet diameter by 85 feet deep each, as made for the MELBOURNE GAS COMPANY

GAS AND CHEMICAL PLANT OF EVERY DESCRIPTION — ALL SUNDRIES SUPPLIED.

OUR

ROTARY EXHAUSTERS

Are acknowledged to excel in efficiency and finish.

OUR IMPROVED

COKE-BREAKING MACHINE

Is a pronounced success.

Designs, Specifications, and Estimates submitted on application to

R. Dempster & Sons, Ltd.,

ELLAND.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

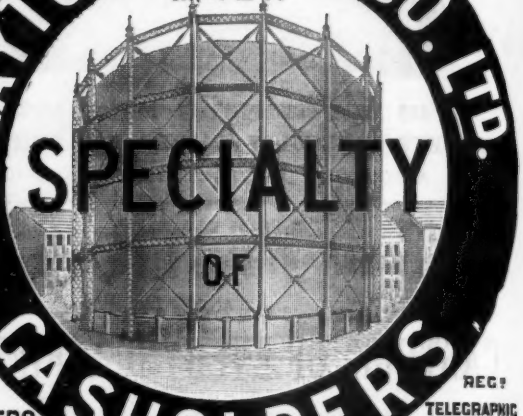
ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET,
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA
STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A



SPECIALTY
OF
GASHOLDERS,

AND
MAKERS
OF

REGd TELEGRAPHIC ADDRESS:
"GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

IMPORTANT ANNOUNCEMENT.

Messrs. Robert and John Dempster beg to announce that they have made arrangements with Messrs. Gadd and Mason and the Patent Gasholder Syndicate to manufacture and erect their PATENT COLUMNLESS GASHOLDERS.

ALL COMMUNICATIONS TO BE MADE TO

R. & J. DEMPSTER,

Gas Plant Works, Newton Heath, Manchester,

OR TO

THE PATENT GASHOLDER SYNDICATE,

504, STOCKPORT ROAD, MANCHESTER.

KIRKHAM, HULETT, & CHANDLER'S, LTD.,

NEW PATENT

"STANDARD" WASHER.

EXTRACTS the WHOLE of the AMMONIA

Also a Large Proportion of H_2S and CO_2 from Gas.

MINIMUM WEIGHT IN MOTION.
MINIMUM DRIVING POWER.
MINIMUM BACK PRESSURE.
MINIMUM WEAR AND TEAR.
WITH MAXIMUM RESULTS.

The following List comprises the orders received for PATENT "STANDARD" WASHERS constructed according to the Company's latest patent, and Renewals effected by the application of same to old pattern Machines.

NEW PATENT "STANDARD" WASHERS.

	Capacity, cub. ft. per 24 hours.
THE GASLIGHT AND COKE COMPANY—	
Kensal Green	3,000,000
,,	3,000,000
West Ham	3,000,000
Liverpool	3,000,000
Rochdale	3,000,000
Manchester	2,500,000
Glasgow	2,500,000
,,	2,500,000
Leicester	2,250,000
Melbourne	1,500,000
Charlottenburg	1,500,000
Derby	1,500,000
,,	1,000,000
Cambridge	1,000,000
Nice	875,000
Barcelona	875,000
Magdeburg	750,000
Valparaiso	600,000
Halle	600,000
Barry and Cadoxton	500,000
Workington	500,000
Lowestoft	500,000
Erfurt	400,000
St. Chamond	350,000
Atlas Steel Works, Sheffield	250,000
Lille	250,000
Rawmarsh	200,000
Vercelli	200,000
Hitchin	150,000

RENEWALS.

THE GASLIGHT AND COKE COMPANY—	
Beckton	2,500,000
,,	1,250,000
Nine Elms (in part)	3,000,000
Shoreditch ,,	2,500,000
Pimlico ,,	2,000,000
Bromley ,,	2,000,000
SOUTH METROPOLITAN GAS COMPANY—	
Vauxhall (in part)	3,000,000
Birmingham ,,	5,000,000
Croydon	1,500,000
Edinburgh	1,500,000
West Ham	1,500,000
Nottingham	1,500,000
Melbourne	1,500,000
,,	1,500,000
Maidstone	1,000,000
Kingston-on-Hull	400,000
Harrow	250,000
Buxton	250,000

Testimonial from the Chief Engineer of The Gaslight & Coke Co.

The Gaslight and Coke Company, Horseferry Road, Westminster, S.W., Nov. 25, 1889.

Messrs. KIRKHAM, HULETT, AND CHANDLER, LIMITED,

GENTLEMEN,—In reply to your enquiry respecting the result of putting "Wooden Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say they have answered admirably for the few months they have been in; and I think them a decided success.—I am, yours truly,

(Signed) G. C. TREWBY.

NOTE.—The first Washer referred to in the above was fitted with improved "Bundles" in May, 1888; and these have proved so satisfactory that The Gaslight and Coke Company have had several other "Standard" Washers fitted in the same manner, and have recently given an order for machines for 6,000,000 cubic feet per day.

PALACE CHAMBERS, BRIDGE STREET,

WESTMINSTER, S.W.

R. LAIDLAW & SON.

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

MAKERS IN EDINBURGH OF

STATION METERS, ALL SIZES
GOVERNORS,
PRESSURE REGISTERS
(To Indicate New Time),
PRESSURE GAUGES,
TEST GASHOLDERS
TEST METERS,
SIEMENS' WATER-METER,
ALL KINDS OF GAS APPARATUS & FITTINGS.

MAKERS IN GLASGOW OF

CAST-IRON PIPES, ALL SIZES
LAMP PILLARS,
STEAM-ENGINES,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
WROUGHT-IRON TUBES AND FITTINGS,
BEAMS, COLUMNS, TANKS, &c.

Wet and Dry Meters of every description repaired, altered, and adjusted, at prices which we shall be pleased to furnish on application.

A LARGE STOCK OF METERS ALWAYS READY FOR IMMEDIATE DELIVERY OR SHIPMENT.

Descriptive Price Lists, Estimates, & full particulars forwarded on application.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

IMPORTANT TO
GAS ENGINEERS AND GAS MANAGERS:

The most Economical, Reliable, and Handy Tool for Forge Work for

ENGINEERS, MACHINISTS, TOOL MAKERS, FITTERS, FORGERS, STAMPERS, COACH BUILDERS,

AND FOR USE IN

GAS-WORKS, SMITHIES, IRON-WORKS, COLLIERIES, &c., &c.,

IS

THE TANGYE GAS-HAMMER

(ROBSON & PINKNEY'S PATENTS)

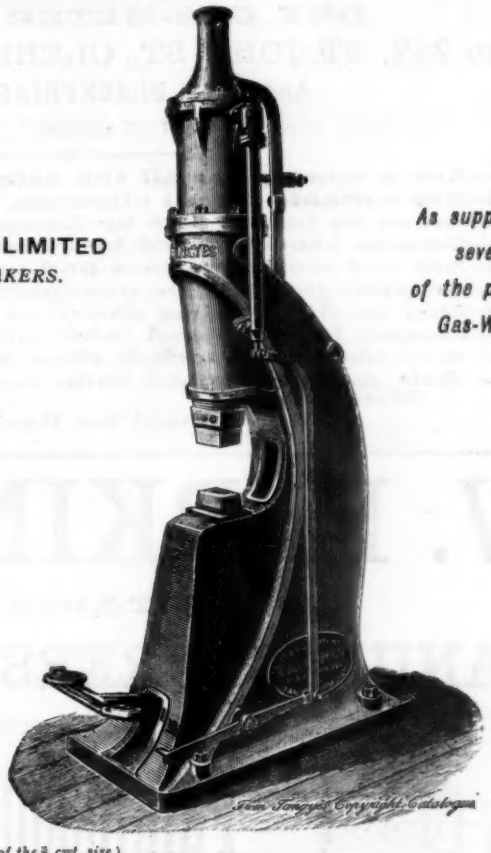
As supplied to several of the principal Gas-Works.

TANGYES LIMITED
SOLE MAKERS.

As supplied to several of the principal Gas-Works.

Hand Gear.

(*From Photos of the ¾ cwt. size.*)



Foot Gear.

The above illustrations represent The Tangye Gas-Hammer as now made. Since its introduction it has been greatly improved both in design and simplicity of working. It has also been constructed to work either with Hand Gear or with Foot Gear.

This—the first Gas-driven Forging Hammer introduced—was designed, and at first recommended only for use in cases where steam was not available or could only be employed at great expense, but the data given below, and which are founded upon reliable and sustained test and trial, demonstrate that the **GAS-HAMMER** may be economically used in competition with the Steam-Hammer, even in places where the price of gas is at its highest.

"*Since the appearance of our* ['*The Engineer*'] *notice, the Hammer has been in some respects re-modelled, and its remarkable economy placed altogether beyond a doubt. . . . The Hammer described is that known as the ¾ cwt. size, and has a cylinder of 7 in. diameter and 6½ in. stroke. The maximum blow is very nearly that which would be given by* **a weight of 3 cwt. falling through a height of 1 ft.**; *and this can be repeated at the rate of* **110** *blows per minute. . . . Extended test in practical smith work has demonstrated that over* **2500 of the heavier blows** *referred to above, can be given with* **one pennyworth of gas** *at half-a-crown per* 1000 *feet—i.e., the Birmingham price to small consumers—or over* 4500 *varying blows for the same consumption.*"—"**The Engineer,**" **Sept. 10, 1886.**

The Gas-Hammer dispenses with Boilers, Coals, Ashes, and Dirt necessitated by Steam-Hammers.

It is ready for work at any moment, day or night, and works as economically for a few minutes' spell as when in sustained operation.

PRICE LISTS AND FULL PARTICULARS ON APPLICATION.

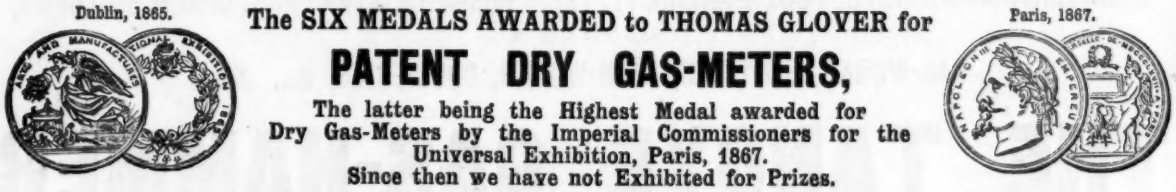
Tangyes Limited, CORNWALL WORKS, Birmingham.

London, Newcastle, Manchester, Glasgow, Paris, Sydney, Melbourne.

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

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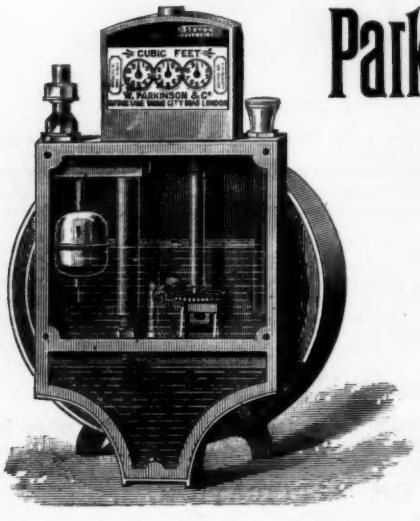

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 16, 1890.

The New Unionism.

THE principles and practices of the so-called New Unionism were boldly advertised and received a salutary check at Southampton last week. Here the majority of the dock hands struck against the employment of non-Unionists; and, encouraged by the weakness and indecision of the town authorities the strikers indulged in a good deal of rioting and miscellaneous violence. Warned at length, however, the executive government of the town finally determined to keep the peace upon old-fashioned principles, without reference to the desires and objects of the self-styled Trades Unionists; and the wonderful new principles thereupon collapsed. The ultimate surrender of the strikers was also hastened by the action of the central authorities of their Union, who, seeing that the local ring-leaders had managed matters badly and were merely courting disaster, waited for a few days before declaring themselves, and then threw the local men over. After the strike had been in progress for several days—during which no reply could be obtained in answer to the urgent appeals for help despatched by the ringleaders to their London Chiefs—it was declared by the latter that the whole affair was unauthorized, and they refused to advance a shilling of the strike pay upon which the Southampton men had confidently reckoned. Could anything be more illustrative than the turn these events have taken, both of the duplicity of the wire-pullers and of the foolishness of their dupes? Messrs. John Burns, Tillett, and Co., will now pose as men deserving of the confidence of the community on account of their having held aloof from the wicked, violent Southampton men. Some respectable newspaper writers have already fallen into the trap, and are telling their readers that, after all, there is something in the professional agitators, who manage to keep their followers on the safe side of the law. The less reputable newspapers, who make it their policy to uphold the self-appointed leaders of the New Unionism, will of course applaud Messrs. Burns and Co. for keeping out of the way of the fighting, and steering clear of a glaring failure. To the majority of clear-sighted witnesses of these events, however, the device of Messrs. Burns and Co. will be perfectly transparent. It will be seen that they simply waited until it could be seen how matters were going before deciding to drop Mr. "Bill" Sprow and his gang as ruthlessly as they have dropped others before them. When violence won, as it did in Leeds, there was no denunciation of it from these men. They appeared afterwards on the same platforms with Thorne, the hero of that campaign of paving-stones and railway-sleepers; and they were glad to share his glory. Now, of course, they will deprecate the rioting that has failed of its object. There is much cunning in these tactics; but it will be too big a job for the leaders of the New Unionism to elevate cowardice and time-serving into lofty principles.

The fact is that at Southampton the strikers made the great mistake of believing that what they had learned to be Trade Unionism would prove superior to the common law of the land. Burns and Tillett, and the rest of their clique, have encouraged Unionists in the conviction that a non-Unionist—or, as they all call him, a "blackleg"—has no rights which other men of a different way of thinking are bound to respect. They have aided and abetted their dupes in applying so much of the great Irish invention of boycotting, in their dealings with non-Unionists, as these thought fit to adopt. Certain newspapers professing great influence with the labouring classes, but in reality more interested in the success of a very different political party, have welcomed this notable importation, which they perhaps hoped would become a little more respectable when known as a resource of the British workman than it has hitherto been as the peculiar appanage of Irish agrarian agitators. Unfortunately, the low-class, unskilled British workman has none of the fine political tact required of those whose necessities oblige them to tread in the tortuous path of the boycotter, or the "exclusive dealer." His notion of treating a fellow man as a "moral leper" is to throw half-bricks at him; and to "send a blackleg to Coventry" means to his dull comprehension putting him into a canal. Therefore, when the Southampton dockers declined to work with non-Union men (which they had a perfect right to do), they proceeded to assault the non-Unionists, to hinder them from working, and to disturb the peace of the town—all which is against the law. If they had gained their point, we should have heard a great deal about the strength of the New Unionism. Having failed to make New Unionism the law of Southampton, the strikers and rioters are of course merely a low mob, with whom self-respecting agitators can have nothing to do.

It appears to us, however, that nearly all the newspapers treat much too seriously these sporadic outbreaks of what on the Continent is called the "proletariat," and John Bright recognized as the "residuum," which is found in all large towns. Now that individuals who have gained more or less notoriety by neglecting their own businesses (if they ever had any), for the pursuit of Communism, Socialism, Atheism, or other "cause" which is irreconcileable with the existing state of society, have found out that useful advertisement is to be obtained by professing to lead the mob, these riotous parades and noisy "demonstrations"

receive an amount of notice that would have both amazed and amused our more rough and ready forefathers. There has always been a Mob; and, to all appearance, this undesirable portion of the community is likely to remain with us. It is not so long ago that frequent "Bread Riots" disturbed the peace of English towns; and what with political, economical, and religious agitations, the causes of which are now only known to students of history, there was always rioting somewhere in the country in times well within the recollection of people now living. But, as Lord Salisbury recently remarked with reference to foreign politics, the telegraph has made a vast difference in the way incidents affect the public. Lord Salisbury said that a century ago, if an Englishman and a Dutchman quarrelled in the East Indies, six months elapsed before anybody at home heard of it, even if the news came at all; and it was then too late to make a fuss over an affair which the principals had possibly forgotten. Now, both countries would learn all the details on the following morning; and the two newspaper-reading publics would be kept in a ferment over the matter until their caterers of news found something else to write about. So it is with these local riots. Disturbances purely due to the Mob are always possible; and when they occur they are mainly due to the outbreak of a spirit that must be rigidly quelled if the community is not to relapse into barbarism. It is the Mob that shouts for "Bill" Sprow at Southampton, just as it shouted for Thorne at Leeds, and has in past times clamoured for Cheap Bread, Parliamentary Reform, Turnpike Abolition, No Popery, Burdett, Lord George Gordon, Sacheverell, Wat Tyler—who and what else? Cromwell knew the Mob when he said that the crowds which applauded him as he passed in triumph through the town would with equal gladness see him executed. This is the lesson which, as it seems to us, that mayors and magistrates everywhere need to bear in mind. Because the cry that the Mob raises for the moment is echoed by a newspaper, and repeated by a member of Parliament, is no reason why the paramount duty of keeping the peace should be foregone. When the Mob has broken loose is not the time for wondering whether, after all, the cry of the poor fellows may not be justified. Vacillation in a magistrate in such emergencies is treason.

The Leeds and Bristol gas strikes should never be forgotten when the Southampton dock strike is named, because all these, and more, are required to illustrate the New Unionism of which Burns, Tillett, Thorne, and Co. are for the moment the recognized leaders. The movement should be seen in victory as well as in defeat, to be thoroughly understood. Trades Unionism, as we have always maintained, it is only in name, for it has no tradesmen among its supporters and those who give its branches their distinctive titles. Some of the newspapers have discovered this fact, and are giving it due importance. The *St. James's Gazette*, for instance, recently declared that these new Unions are frequently not Unions at all. Such a Union may have a long-winded name and a banner; but "it has hardly any funds, no permanent membership, no "real connection with any craft. A dozen professional "agitators and demagogues can constitute themselves the "Union of one of those rough trades which employ so "large a proportion of the casualty labourers." The executive of such a "Union" is further described as "a knot "of gutter-adventurers, meeting in the back room of a "public-house." All this is much too true to be pleasant reading for the individuals in question.

It is to be hoped that working men will not be much longer in perceiving the hollowness of Unions that rest their claims for support less upon the benefits they are capable of conferring upon their subscribing members than on the assumption that they can prevent non-Unionists from working. Experiences such as those of Manchester, Salford, and Southampton, to say nothing of the South Metropolitan strike, show that Union officials are slippery customers when called upon for strike-pay. Strikes of unskilled labourers can only succeed by the help of violence; and wherever rioting and outrage are prevented such strikes invariably fail. When they fail, the Union leaders will certainly either deny responsibility for advising the strike, or pay as little strike-money as they can for the shortest possible period. With the first convenient excuse, the Union cash-box will be closed, and the deluded strikers abandoned to act as "blacklegs" in their turn if the chance comes in their way. This is the New Unionism; and John Burns is its Prophet.

The South-West District Association Meeting.

THE members of the South-West of England District Association of Gas Managers held their twenty-seventh half-yearly meeting at Bristol on Tuesday last, under the presidency of Mr. John J. Jervis, of New Swindon, when an interesting programme was satisfactorily gone through. In the course of his opening remarks to the meeting, Mr. Jervis took up the suggestion recently offered in the JOURNAL respecting the collection of data concerning new works constructed by members of such Associations; and he recommended the nomination of a small Committee for this duty. We are decidedly of opinion that, if the managing Committees of these District Associations of Gas Managers only took the matter in hand, and devoted to the task a little intelligence and zeal, they could depend every year upon obtaining something interesting for their colleagues to talk about. An illustration of this was supplied at the Bristol meeting by Mr. Jervis himself, who directed attention to the new telescopic gasholder erected at the Swindon railway gas-works, which has guide-framing only for one lift. This holder which Mr. Faulkner described as working very successfully, is a welcome proof that the new ideas of gasholder construction are spreading in the country. The President-Elect, Mr. S. W. Durkin, of Southampton, read a paper on purification experiences, mainly explanatory of the author's method of working the air process, with which he professed complete satisfaction. Mr. Robert Beynon, of Torquay, also contributed a description of a method of ventilating lime purifiers before disturbing the spent lime, which he finds useful for preventing complaints of nuisance. The two papers were discussed together, when it transpired that some of the members are still rather afraid of the air process. Such papers as those of Mr. Durkin and Mr. Beynon are just what is required for the meetings of District Associations; and their subject is particularly suitable for the study of managers of gas-works situated in the district covered by this particular organization. Many southern and south-western towns are pleasure and health resorts; and the avoidance of anything resembling a nuisance from the local gas-works is imperative in the interests of the town, which means the prosperity of the Company. Whatever may be the case in manufacturing districts, in residential towns it should be the pride of the manager that his gas-works could not be smelt in the next street. More attention is paid to this point than was formerly considered necessary; but a good deal remains to be done in various places. Mr. N. H. Humphrys, of Salisbury, next read a paper on some recent designs by himself of hydraulic and foul mains, which was offered as a stop-gap, but was well worthy of attention on its merits. Mr. D. Irving, of Bristol, contributed a brief description of his patent hydraulic bridge-valve and flushing apparatus to this part of the proceedings, so that the meeting had no cause to complain of want of variety in the technical fare offered for digestion. We should not omit to record, moreover, that Mr. J. L. Cloudsley exhibited at the meeting the meter with cash-valve indicating attachment which was described and illustrated in the JOURNAL last week. A visit to the Stapleton Road station of the Bristol United Gas Company prefaced the indoor business of the meeting; and Mr. Irving hospitably received the visitors to these works, which are under his charge. The day's proceedings ended with a dinner. Altogether, the meeting must be pronounced a very pleasant and successful one.

Gas and Electric Lighting at Bradford.

THE report of the proceedings at the meeting of the Bradford Town Council on Tuesday last, when Alderman Priestman moved the adoption of the minutes of the Gas and Electricity Supply Committee, which comprised the report on the working of the Gas Department for the past half year, comes very opportunely in support of what is advanced in other portions of this issue of the JOURNAL about the mistake of mixing up gas with electric lighting. It might be argued very plausibly that, with regard to electric lighting, a gas-supplying Local Authority stands in a different position to a Gas Company. The latter, it might be urged, is a trading concern, and has consequently no other reason for desiring to supply electric lighting than the wish to make a profit, to which it has no sort of prescriptive claim. On the other hand, if a Municipality, actuated by a desire to keep the use of their streets to

themselves and exclude strangers, wish, notwithstanding that the advantages (such as they are) of electric lighting should not be denied to the local public, there is nothing for it but to start an electric light undertaking with the public money. In such a case, what department of the local governing and supplying authority is so fit to take charge of the venture as the Gas Committee? All this is quite reasonable; and we admit that, if Municipalities are to supply electric lighting, the Gas Committee, if one exists, is likely to be more familiar with the general principles of the new business than any other Committee. The fact remains, however, that the two interests continue separate, and should be treated as such. Municipalities, in the North of England at least, have gone into the business of supplying gas for the same reason that moved the Companies which they have succeeded—for the sake of the profits. An unprofitable gas undertaking would have no attractions for an average Municipality. It is, or will be, the same with regard to electric lighting. Municipalities argue in most instances that they only want to undertake this business in order to keep out speculators and retain the control of their streets; but their true motive is the desire to secure whatever profit there may be in it. They see themselves surrounded by speculators, clamorous for Provisional Orders for electric lighting; and they naturally conclude that the attraction must be prospective profits. Now it is leaking out by degrees that, according to the experience of Bradford, electric lighting is far more trouble than it is worth to a Corporation Gas Committee. The addition of this responsibility to the work of the Bradford Gas Committee was a "fad" of Mr. Alderman Priestman's. He was very keen on the matter; and he has now been in possession of his desire for a period sufficiently long to manifest the results. It has to be gleaned rather than gathered in full, however, that these results are not quite as satisfactory as they might be. Taking the last minutes of the Committee, for example, the very full report relating to the gas undertaking, showing a satisfactory increase of business, was accompanied by a resolution of the Committee accepting a tender for additional work for the electric lighting undertaking. This way of putting the minutes evidently awakened in some members a suspicion that expenditure on the electric light plant was being smuggled through the Town Council; and accordingly the question was asked why a separate statement had not been given with regard to this undertaking—the inquirer asserting that scarcely a month passed without something having to be voted towards it. Another member asked what was the amount of the loss on the speculation, mentioning a rumour to the effect that it was £2000 up to the present time. Alderman Priestman, in reply, said that he hoped to present a statement relating to the electric light works at the end of the current year, and only confessed to a loss of something under £1000. He declared that if the Council would take £10,000 from the gas profits for the benefit of the electric light works, they would be made to pay their way. If they did not do so shortly, the price of the supply to the private consumer would have to be raised. This is a cheerful prospect, alike for the Corporation and the consumer of electricity. If Alderman Priestman thinks that a losing business is to be made profitable by raising the price of the commodity, and consequently limiting the demand for it, he is a remarkable economist to figure as a leader in a commercial community. Once permit the ratepayers of Bradford to realize that electric lighting is a losing game, and they will quickly form a right opinion of the wisdom of the policy of their local rulers, which has been to lay out public money at a loss, in order to prevent private speculators from pursuing the same unsatisfactory course.

Society of Engineers.—We have received a copy of the "Transactions" of this Society for the year 1889, edited by the Secretary, Mr. G. A. Pryce-Cuxson; but it does not call for any extended reference, seeing that all the proceedings in which our readers are more especially concerned were noticed in our columns at the time of their occurrence. It may be remembered that, from this point of view, the most interesting paper of the session was that by Mr. Samuel Griffin, on "Modern Gas-Engine Practice," read Nov. 4 last year. This appears in the volume just issued, together with a reproduction of the drawings referred to by the author. A very useful feature of the book is the continuation of the general index to the Society's proceedings from 1861 to the present time.

WATER AND SANITARY AFFAIRS.

THE recent correspondence in *The Times* on the subject of the Metropolitan Water Supply has led at last to an editorial article in the columns of that journal. It is to be regretted that the argumentative tone which characterizes some portions of the article gives place in one part to an unseemly outburst, in which the London Water Companies are accused of perpetrating a "barefaced robbery," simply because they abide by the law which prescribes that they shall charge for the supply according to the rateable value of the premises to which the water is laid on. It is quite true that the quinquennial valuation will in some cases raise the rateable value; but it will not do so universally. The value will in some instances remain unaltered, and in others will be actually diminished. But whatever objection may lie against the present mode of charging for the water supply in London, it is difficult to see what better plan can be devised. If we look to the local authorities in the provinces for an example, we do not find that the supply by meter accords with their ideas or their practice when the supply is in their own hands. In London, the foremost authority in the water agitation—namely, the Parliamentary Committee of the Vestry of St. James, Westminster, under the leadership of Mr. James Beal—has reported against a meter supply. The great Municipalities of Liverpool, Manchester, and Glasgow attempt a kind of compromise, charging for the supply partly by a domestic rate, and partly by a public rate. But how is the "barefaced robbery" avoided in this case? Whether it is a domestic rate or a public rate, the basis must either be rateable value or annual value. In London the system of charging on annual value was superseded by rateable value, as a boon to the consumer, and as a check to the rising prosperity of the Water Companies. Therefore, we may presume that, where the charge is based on annual value, the burden is so much the heavier. But look at the matter as we may, and "split the difference" as we will, we find that there is a relation between the charge for the water and the value of the premises. What is there in the law to prevent an enlarged return to the municipal coffers, when the rateable value of a district increases? There is also the "injustice" (to use another of the phrases in *The Times*) of charging by means of the public rate in those cases where the premises are not supplied with water from the public works. If the London Water Companies were to charge for water where they gave none, something still more emphatic than what we now hear would probably be said about "injustice" and "robbery." Still we confess that a public rate has its merits; for a supply of water to a town or a city is a general benefit, as much as town drainage; and the authorities are, for that reason, justified in making a general rate in aid of the cost. It is also a very profitable and helpful method, as it embraces a wide class of property, whereby in Manchester, as stated by Mr. George Kebbell, the public rate of 3d. in the pound produces as much as the domestic rate of 9d.—the latter being only charged upon houses taking the water, which also have to pay the 3d.

Observing the provincial example, the people of London may speculate upon their prospects in the event of the Metropolitan Water Supply becoming public property. Whatever else may be changed, the basis of the charge is not likely to undergo any material alteration. The leading article on this subject in *The Times* is designed to promote the purchase of the existing water undertakings in the Metropolis. The effect of the quinquennial valuation of property is deprecated; and it is argued that, if this process is to go on, the value of the undertakings will at length be so augmented as to render purchase impossible. Yet this by no means follows. The increased rateable value of the Metropolis is largely due to the erection of new houses, which, of course, all contribute to the revenue arising from the supply. Many old houses are also pulled down, and reconstructed on an enlarged scale. The question at any time is not merely what the undertakings will cost to buy, but what profit they will yield. The bargain will be as good twenty years hence as now, if the profits are in the same proportion to the purchase-money. The revenue of the Water Companies is greatly assisted in its growth by the process of building in districts which lie outside the Metropolitan boundary, and which are not touched by the Valuation Act. Including the whole of

the districts within and outside the limits of the Metropolis, something like 80,000 houses are added in the course of five years to the number supplied with water by the London Companies. Growth in the value of the undertakings is inevitable, even if existing houses experienced no rise in their rateable value. Neither does the market value of the undertakings depend solely on the amount of capital that they have absorbed. The purchaser will rather give consideration to the profit which he may expect to realize. If the water undertakings of the Metropolis failed from any cause to yield a profit, the capital expended upon them would be of little consideration in the terms of purchase. It seems almost forgotten that whoever buys the water undertakings of the Metropolis will purchase the revenue as well as the plant. We are glad, however, to find *The Times* opening its eyes to one thing—that, if Parliament should feel called upon arbitrarily to set aside the enhanced value of the undertakings, the result "would injuriously affect "the value of property of every kind." To avoid this widespread calamity, it is suggested that something should be done to "suspend the ordinary quinquennial "increase of declared rateable value, or at least to sus- "pend its influence upon the price of water, and upon "the value of shares in Water Companies" pending a transfer to a public authority, such as the London County Council. But we fancy this would itself be a "setting aside" of enhanced value, and would injuriously affect all undertakings based on an Act of Parliament. It is a little amusing to find *The Times* advising against "vain regrets" concerning "the mistakes of ten years "ago," and hoping "that we may be saved from repeat- "ing them." Lord Cross's scheme is thus once more vindicated, and the unwisdom of the daily press admitted. The advice now given by *The Times* is that the London County Council "could find no surer road to "public usefulness than in elaborating and completing "the plans for the purchase of the interests of the Com- "panies, which have long been subjects of more or less "idle talk, and in forecasting the arrangements which "increase of population will soon render necessary, in "order that it may be met by corresponding increase of "supply." The Companies may be relied upon to keep up the supply to the level of the demand. As for the purchase, we have lately shown that a fair price is easily to be arrived at, if equity is really intended.

Twisted Cast Iron.—The *Chemical Trade Journal* alludes to some specimens of cast iron which exhibit unusual properties, produced at one of the great stove manufactories in Albany, New York, and which have excited much interest; the pieces of metal being about 1 inch in width, ⅛ inch in thickness, and some 15 or 18 inches in length. Of these strips, some were twisted so as to form spirals, and others were wrapped upon coils. That cast iron can be made very tough, and even a certain amount of elasticity be imparted to it, is, of course, well known; but it is unusual, if not unprecedented, for any metal employed in stove foundries to bear such tests as those here indicated. The twisting and bending in this case were done hot; there being nothing in the specimens but a judicious admixture of good irons and the absence of old scrap—the fact being also stated that the irons in question represent the daily meltings of the foundry from which they came, all the stoves produced there having their plates of the same metal that exhibits this peculiar toughness. It is not asserted that, because the metal will bear a torsional strain of the kind described, it is therefore unbreakable; there being, of course, a limit to its remarkable elasticity.

The Use of Gas Profits for Public Works.—In a recent issue, the *Philadelphia Press* published a statement to the effect that the cost of gas, delivered at the burner, in Chicago, in the six months ending June 30 last, was 45·27 c. per 1000 cubic feet, as compared with $1·22 charged by the Philadelphia Gas Trust. Commenting upon this fact, the *Press* inquired how it was done, and why, if gas could be actually supplied at the house of the consumer—not merely sent into the gasholder—at less than half a dollar per 1000 cubic feet in Chicago, it could not be sold in Philadelphia for (say) twice as much, or about 25 per cent. less than now. Our contemporary *Light, Heat, and Power* answers the first question tersely: "Cheaper methods; private management." As to gas being supplied in Philadelphia for $1 per 1000 cubic feet, the last-named publication believes it could be done, even with the distributing appliances, in their present wretched condition, if the "robber policy" of compelling the gas consumer to pay for the non-consumer's public lighting were abandoned, and the city paid for all the gas it uses, as it should do. There would then, it is added, be bigger balances in the pockets of the consumers, but smaller ones on the report-sheets of the Department of Public Works.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 613.)

THE general tendency of prices in the Stock Market last week was downwards; but this was owing to recognizable and satisfactory causes only. Chief among these, was the higher value of money; and a 5 per cent. Bank rate is looked for as an imminent probability. There has also been some realization of profits. As for the Gas Market, it could hardly have been quieter. Business is not often so limited as it was last week; and there is no event of any moment to chronicle. Prices, however, have not drooped; and the few variations which can be noted in quotations are all for the better. Dealings on a small scale in Gaslight "A" have been marked every day, and at steady figures—averaging about 238¾. The lowest point touched was 237½; while one parcel of stock was done specially at 240. A transaction in "H" was effected at top price; and the quotation was put up on the following day. But a bargain in the 10 per cent. preference was made at the low figure of 248—well below the nominal quotation. South Metropolitans have been very quiet. Two transactions in "B" were done on Monday, at better than medium price; and some debenture stock was purchased on Saturday at a good high figure. The only operations in Commercial were in debenture stock, at about 121. This stock stands the cheapest of its class in the market; while, in our opinion, it ought to stand second to none. Small as the amount of the issue is, it forms the sole prior charge upon a prosperous undertaking, lightly burdened with capital, and exceptionally well situated in relation to cash balances and reserves. Its debenture stock ought to be worth 128 at least. Suburban and Provincial companies have been quiet, as usual; nothing being touched but Brentford and British, the quotation of which last is 1 better. Bromley and Brighton and Hove are quoted as high *ex div.* as they were with the dividends in them. Foreign undertakings have not been much dealt in; but they all stand very firm and steady. An improvement is perceptible in the Argentine and Uruguay companies; and the Indian are looking forward to better rates of exchange. The Continental undertakings present no feature. In Water, business has been very restricted; though there were some movements in prices. Chelsea has improved 1; but East London is less firm, and the debenture stock is 2 lower. A reduction was not out of reason, considering that the stock was, and still is, priced higher than New River debenture, which is the pick of the market.

The daily operations were so inextensive that they may be summarized briefly. Transactions on Monday were chiefly in Gaslight "A" and South Metropolitan "B," at good steady figures. Tuesday's business was almost wholly confined to Gaslight "A." British rose 1. In Water, East London debentures fell 2. Wednesday's business was limited to three transactions; and Thursday was not much brisker. Gaslight "H" rose 1. Friday was more active, and prices generally kept up well; though Gaslight "J" changed hands at a low figure. Chelsea Water rose 1. Saturday's transactions were unimportant; and all quotations closed unchanged.

ELECTRIC LIGHTING MEMORANDA.

The First Meeting of the United Brush Company—Mr. W. Livesey on Gas Companies and Electric Lighting—Tower Lighting Confessed a Failure.

THE first annual general meeting of the new Brush Company, which is the union of all the remaining Brush interests in this country, was held on the 8th inst., under the presidency of Lord Thurlow. The speech of the Chairman was largely devoted to an explanation of the amalgamation proceedings, which are not of much interest to anybody besides the shareholders who have exchanged their old scrip for new. A great fuss has been made about the acquisition by the Company of the Falcon Engineering Works at Loughborough, which are to enable them to make the heavier parts of the electrical plant sold under the Brush and other patents owned by the Company. Those proprietors who opposed the purchase of the works will not be reassured by the intelligence that it has cost at least £20,000 to fit them for the Company's purposes. The Chairman congratulated the shareholders on having nearly got to the end of the litigation in which the Company have been involved almost from their commencing business, and in which they have been fairly successful. Then Lord Thurlow went into the matter of the Electric Lighting Provisional Orders taken up by the Company; and he remarked that the cost of carrying out the lighting of the Company's portion of the City of London will be about £300,000. The transactions of the Company for the past year show a gross profit balance of £36,698, of which the sum of £14,325 was disposable for dividend purposes. Accordingly upwards of £7000 has been applied in payment of a dividend of 6 per cent. upon the preference shares. On the whole the Chairman was disposed to think that the Brush Company in its consolidated form has a future before it, and will come in for a fair share of any electrical engineering contracts that may be going.

In our "Correspondence" columns will be found a timely letter from Mr. W. Livesey on the subject of applications by gas

companies for Electric Lighting Orders, to be worked as part of their ordinary business, with their gas capital. As the writer observes, several gas companies made applications of this kind last session; but they were dropped in every case. To attempt their retention would have been to sacrifice the Confirming Bills, for reasons given by Mr. Livesey; and so they were prudently thrown over. The last paragraph of Mr. Livesey's letter refers to an exceptional case in which a gas company was permitted to raise separate electric lighting capital for an independent electric lighting undertaking; but, as the writer pertinently enquires, of what benefit could this be to the shareholders of the gas company involved? The truth appears to be that all Mr. Livesey's learned disquisition upon the principles governing parliamentary dealings with authorized monopolies may be summed up in the saying that "the cobbler must stick to his last." Gas companies are not in any special way adapted for supplying the electric light or for the manufacture of lucifer matches; and they can no more powerfully urge a right to a monopoly of the one than they could of the other industry, supposing both to be subject to similar statutory regulations. There is nothing in gas plant, either manufacturing or distributing, that can be regarded as utilizeable for an auxiliary electric lighting plant; and for a gas company to grasp at electric lighting as some foreign companies have done, is pure greediness of gain, which is invariably disappointed. There is no European gas company at this time making a profit by electric lighting; and if there are any in America, they have kept wonderfully quiet about it. It is to be hoped that no more will be heard of these petitions from British gas companies to be allowed to undertake electric lighting in the notices for the Gas Bills of next session.

One seldom hears anything now of that remarkable fad of the scientific electrician, who is always supposed to be so much more advanced and intelligent a person than the gas engineer, the tower system of street lighting. The contemporaneous discovery of "French measurement" for electric arc lamps, we have still with us; although it is only tacitly used by the Brush Company. It has never been applied even by this Company to incandescent lamps; so that we have the very scientific anomaly that, while the estimated candle power of Brush arc lamps has to be divided by four to bring their "French" down to English measurement, the incandescent lamps of the same Company are understood to be valued on the simple photometrical footing of a common gas-burner. To return, however, to the once fashionable idea of tower lights. It seemed quite like a remembrance of the days of the electric light "boom" of 1882, to read the other day in an American journal that "last night the gas-lamps were lit all over Allegheny City to relieve the intense darkness in which the electric light towers left many of the streets and alleys." There was great rejoicing, we are told in the newspaper report, among the majority of the townspeople at the return of the street lighting authority to gas; the towers having been the cause of much complaint. What actually happened, of course, after the towers were erected was precisely what any sensible person need not be an electrician nor a gas engineer to picture. Most of the houses threw across the streets dark shadows, which were much appreciated by burglars and footpads, who throve while the electricians were being permitted to exhibit their ignorance of the elementary principles of street lighting. The light towers were doubtless found useful by cats on the housetops; and it is on record that the hills overlooking the town of Allegheny were most decidedly the best lit portions of it. These considerations failed to satisfy the ratepayers and honest wayfarers, who at length, for a wonder in the annals of United States Local Government, have had their wishes attended to by their elected representatives. It is greatly to the credit of the Allegheny City Board of Aldermen that they have listened to the voice of reason, although tardily. Perhaps, however, the usual arguments of the electricians had given out, in consequence of bad business in the town, in which case of course the City rulers were left free to consider the interests of the community, and to order in the gas that should never have been ordered out for so monstrous a substitute as electric light towers.

The British Association.—The Leeds meeting of the British Association this year has been only a small and quiet one; the attendance numbering not more than 1700 in all the Sections. Happily, however (as is remarked by a contemporary) the weather all through was excellent, and brilliant sunshine cast a glow over the ugliness of the place, and rendered the excursions to the Aire and the Wharfe valleys delightful. The usual social accompaniments of British Association meetings were not so plentiful as at former meetings; but everyone seemed satisfied with the hospitality displayed. Hardly any paper of high and wide scientific importance has been read this year in any of the Sections. There have, however, been several important discussions on the reorganization of some of the Sections, which attracted much attention, and several changes are to be made. Next year's meeting of the Association will take place at Cardiff, when Dr. Huggins will preside. It has been arranged to hold the 1892 meeting in Edinburgh; and the 1893 one at Nottingham.

WHY NOT A GAS MANAGERS' UNION?

A NATURAL result of the Trades Union Congress has been to direct attention to some of those labour problems which are loudly asserted to be pressing for settlement. It has also had the effect of proving once more that the unionists themselves are far from being united. There are clearly the widest possible differences of opinion, not only with regard to details but on fundamental principles, between those who style themselves the New Trades Unionists and the older party who divide the camp with them. As repeated experience has shown, the Burnses, the Tilletts, the Thornes, and the others who constitute the new wing of working-class organization, look to Socialism to solve the difficulties which are wont to arise between capital and labour; while the Broadhursts, the Fenwicks, the Burts, and the rest of the older Trades Unionists are content to rely more upon the individual than upon the State, and believe that a given end is more likely to be achieved by peaceable agitation than by revolutionary methods. With the struggle between the rival parties, we are not now greatly concerned. It is sufficient for our purpose to recognize the fact that there are divided counsels, and that though the new section is apparently in a minority at present, its persistence is likely to keep it well to the fore. What this means for the general trade of the country we shall learn in good time. We already know something of its effect upon the gas industry; and recent events have not been of a nature to lead us to believe that the future will be different from the immediate past. There is, indeed, reason to believe that those who have made the burden of many gas managers well nigh intolerable, will continue their mischievous course. Severe though their defeat was in South London, in Manchester, in Salford, and in other places, and great as was the suffering entailed on their victims, it is not in human nature to suppose that those who live by agitation will relinquish its pursuit so long as it pays better than honest toil.

It has been suggested that it is part of the policy of the Gas Workers and General Labourers' Union to attack individuals, and keep up a kind of guerrilla warfare with those who own and control gas undertakings, rather than attempt operations on any large and general scale. In the pitched battles of the past, the leaders of the Union have certainly been overwhelmed with disaster. They are not likely, even if they had the opportunity, to invite another engagement with Mr. G. Livesey, while the Gas Committees of Manchester and Salford are also probably free from risk of any molestation in the near future. With some of the smaller works in different parts of the country, the case is possibly different. They can be assailed with comparative impunity. If the attack is repulsed, very little is likely to be heard of it; while if it happens to succeed, it can be loudly vaunted as an example of successful combination. In either case it may help to swell the ranks of the Union, and be made an excuse for "levies," "extra-grants," and other devices for increasing the revenue of the organization. The position of the manager whose works may be selected as the object of an assault of this nature, is not to be envied. The most trifling cause may lead to hostilities. It may be nothing more serious than the discharge of a man whose services can be dispensed with, or some trifling change in the accustomed routine of the place. There may, indeed, be no cause at all; and yet, with the scantiest warning, the men may threaten to turn out, and put those responsible for the regular lighting of a more or less extensive and thickly-populated district in the sorest straits to fulfil their obligations. In such a crisis, much will depend on the nature of the men who constitute the governing body of the undertaking. With a weak Board of Directors, or a Gas Committee more anxious to conserve their individual popularity than to advance the real interests of the works committed to their charge, the manager is in great danger of being left to fight the battle single-handed, or else of finding an ignominious treaty of peace signed behind his back. In the former case, he need not wholly despair; for if he possesses sufficient "grit" to carry on the struggle against considerable odds, he may achieve a brilliant and deserved victory. In the latter, his authority will probably be fatally undermined, and nothing will be left for him but retirement from an untenable and most unpleasant position.

Whether managers and engineers can take any step which may have the effect of warding off, or at least minimizing, the threatened danger, is a question surely not altogether unworthy of consideration. In ordinary branches of industry, we find the unions of the workmen met by combinations of the employers. Colliery proprietors, iron masters, and cotton spinners, for instance, have their associations, vested with power to regulate and adjust hours of labour, rates of payment, and other matters touching the conditions of employment, and the remuneration for it. It is true the position of affairs prevailing in any one of these trades differs very considerably from that which obtains in the gas industry. The men who constitute such associations of employers are in most instances the actual owners of the works, responsible to no over-riding body of directors. This is not invariably the case; but the exceptions are so few as to seldom have the effect of endangering the combined verdict by the "ratting" of a minority. In connection with gas undertakings, the conditions are almost entirely reversed. There are exceedingly few instances in which these are owned by individuals; and a manager who is himself a servant of others might be in most cordial agreement with the decision of a representative body

of his professional brethren, and yet find himself utterly powerless to give effect to it. Difficulty would also arise, in all probability, from the very wide difference which prevails between works. No two gas-works in the country are exactly alike; and there are no two in which operations are carried on in precisely the same manner. The framing of hard-and-fast rules as to conditions of employment, so as to meet every emergency, would therefore be impossible. A large amount of latitude would have to be allowed; and after all there would necessarily be much that must be left to individual judgment and discretion. Yet, when all this is conceded, there would still be a great deal that an association of gas managers, such as is hinted at, could usefully perform. It might be made of immense service in collecting and collating statistics and other information for the general use of its members; and it would be an invaluable means of inter-communication on all subjects relating to the questions which come within its scope. A manager who belonged to it would be able to draw upon the general stock of knowledge and experience whenever he was confronted by a difficulty with which he felt unable to deal, or was met by a demand which appeared unreasonable and outrageous. For the reasons stated, it could hardly be vested with any legislative authority, but, as a consultative body, it would be of the very highest value.

Upon the question whether such an association should have a national basis, or whether there should be a series of associations covering certain defined areas, we offer no opinion. A society, by whatever name it might be called, which was more or less representative of the United Kingdom, would for some purposes be of more value than one which had a narrower constituency. It could collect information which would be complete in its character, and would admirably serve the purpose of a bureau for the collating of facts. But there is some danger that it might prove a little unwieldly in operation. That very representative character which would be one of the main sources of its strength must also prove a cause of weakness. Its members would find few opportunities of meeting to express and exchange opinions; and in times of little excitement, its gatherings, however centrally they were held, would hardly prove sufficiently attractive to draw men from the extreme corners of the kingdom. With district associations these objections could not prevail. They would be less representative; but they would be found less difficult to manage, while the information they gathered and disseminated, would possibly be amply sufficient to guide their members to a decision in matters of doubt. One thing which seems clear to us is that any organization of the kind ought to be kept quite distinct and apart from any of the existing associations. Neither The Gas Institute nor the various District Associations have been formed for the purpose of dealing with labour questions. Their object, as is more or less clearly defined in their rules, is to deal with the manufacture and distribution of gas as a science, and to discuss such points of technical interest as may seem worthy of debate. They have none of the characteristics of boards of conciliation, and have absolutely nothing to do with "labour troubles" in any form. This has more than once been recognized and emphasized in the recent past; and if any united action is desirable, as we think it is, it would be far better to start from a new basis than to run the risk of inflicting perhaps irreparable injury upon organizations which, in a different sphere, are already rendering such good service to the profession.

ENERGY, OR LIGHT?

In another column will be found a curious composition by a Belgian writer, a M. Paul Hoho, which was read, as a technical paper, before the Société Belge d'Electriciens, and was entitled "Electric Lighting Many Times Superior to Gas." The paper has been reproduced by the *Electrical Review*, which journal at the same time, in a short editorial note, expressed curiosity as to the "complexion" that the technical press devoted to the gas industry would put upon M. Hoho's results. Our contemporary admitted as a possibility that the author "may have based his conclusions on false premises," and remarked that in this case they would soon be "opposed" by us. We have no objection to this comment, but think that the word "exposed" might have been more appropriate than that which actually occurs in it. The following up and exposing of electricians' false logic and misleading ways of stating facts, has been our peculiar care for some years; and, as time goes on, we do not find this task lightened, but rather the contrary. It is not for us to set up as a pattern for the electrical or any other technical journals to imitate; but we can at least claim that these columns are always open to statements from all parties, and in particular that we give every opportunity for electricians to plead their own case. Thus we reproduce M. Hoho's paper in full, for what it is worth; and it is nobody's fault but the writer's own if his statement is found after all to amount to little or nothing. He probably thinks a great deal of it himself; but he will be almost singular in this opinion.

M. Hoho is not hindered by modesty from stating his case in the strongest possible way. He believes that he has absolutely wiped gas lighting off the face of the earth, by bringing against it "figures which admit of no appeal." With a view to prepare the friends of and believers in gas for this stern sentence, M. Hoho kindly explains at the very commencement of his paper that the matter is all a question of "energy." He essays to compare the expenditure of energy in the form of light by the way of electric lighting, with that of gas lighting; and he triumphantly concludes, from his way of stating and arguing the question, that gas is simply nowhere. He is even exuberantly merry at the preposterous notion of using a gas-flame as a lighting agent; and he only excuses the practice on account of the ignorance of mankind, who knew no better. Try to light by means of gas-flames, after physical science has demonstrated that a gas is a poor radiator, and that it only becomes luminous at all by imparting heat to solid particles occurring in it? Why, argues M. Hoho, the idea is ridiculous! He proves this by reckoning up the proportion of the potential energy of a gas jet that appears as light; and then he does the same for an incandescent electric lamp. The result is to show that, "in order to produce a luminous intensity of 16 candles, a gas jet consumes 22·71 to 39·75 times more energy than an incandescent electric lamp, counting the latter at 2 to 3½ Watts per candle, and the consumption of gas at 180 litres (6·3 cubic feet) per hour."

This is M. Hoho's theoretical proof; and it shows that, as a medium for converting energy into light, the incandescent electric lamp is from 22 to 40 times more efficient than a gas-flame. It is a very pretty operation, and the use made by the Belgian theorist of the C. G. S. system looks very learned and convincing. Even the essayist himself, however, is afraid to linger too long on the contemplation of his result; knowing full well, as he says, that somebody would be sure to answer him before long in what he disdainfully calls "the eternal refrain of theory and practice." It is naturally very annoying to an ardent theorist to be pulled up in full career by an adverse signal (to borrow a metaphor from railway engineering), and to be told that the epoch-making run which he had fondly hoped he was indulging in was due to his having dropped all his coaches and keeping full steam on a light engine. What is the good of talking about the theoretically possible, while the actual lags so lamentably behind? M. Hoho feels the point of the reproach, and hurries to show that he is not afraid of repeating the comparison between the relative efficiencies of gas and electric lamps, even when practical considerations are taken into account. In so doing, however, he first of all reduces the difference between the gas and the electric lamp from his ratio of 1 : 22 or 40, to 1 : 5½ or 9. Before he finishes, moreover, the ratio, even in his hands, comes down to 1 : 2·74 or 4·8. At this figure, however, we begin to raise our heads once more, and think of the possibility of applying a little correction to the electrician's data. While he was talking of electric lamps from 22 to 40 times better than gas-lamps, it would have been idle to enquire whether the gas was taken at its fair value. To a man anticipating instant decapitation, the question of the value of his life, in the insurance agent's sense of the term, under different conditions, would be immaterial. Similarly, while M. Hoho was condemning gas to immediate extinction as the crude provisional device of a half-civilized people, the question of the duty of different burners would be an idle one. But when the electrician deigns to confess that from a point of view which he does not debar himself from taking, there is a difference between electric lamps and gas of only as about 3 or 4 to 1 in favour of the former, it is time to inquire what sort of lamps he is talking about. He takes the duty of incandescent electric lamps at from 2 to 3½ Watts per candle, which is favourable enough in all conscience. The gas-burner he values at 16-candle power for a consumption of 6·35 cubic feet per hour, or a duty of 2·36 candles per cubic foot, which is only true of the worst and cheapest burners in use anywhere for gas of average quality, even as judged by a Continental standard. Recuperative gas-burners as good in their way as those incandescent lamps cited by M. Hoho, will give a duty of at least three times his figure, as the most cursory investigation would have indicated. Thus, by merely applying the first and most obvious correction to M. Hoho's calculations in their final form, we make the comparison of incandescent electric lamps with gas bear the contrary aspect to that which it assumes in his hands. This is easily done, moreover, without challenging M. Hoho's method, but merely by correcting a single datum.

To go back from this result to the Belgian electrician's first startling contention—which is infinitely more striking than the ultimate result after he has corrected his argument by reference to practical considerations—how is it possible to contend that the electric incandescent lamp is from 22 to 40 times more efficient a converter of energy into light than a gas-flame? M. Hoho does it by regarding for his own purpose the two lighting agents as identical in character, whereas they are as widely different as any two things used for the same purpose can possibly be. Gas is merely a fraction of the components of coal, from which it is obtained by a process essentially chemical. When it is ignited in a lamp or burner for the sake of its light, this is the first and last conversion of its potential energy. We know that in this conversion a good deal more energy appears as heat than as light, which is sometimes an advantage, and sometimes the reverse. The practical problem of varying at will the ratio of the heat to the light of a burner, or rather of concentrating the former, is what gas-lamp makers

are engaged upon to-day with hopeful prospects. If M. Hoho does not believe us upon this point, he can inquire of a dozen inventors of gas-lamps, who not think they have lost all their labour. The incandescent electric lamp, however, is the last of a series of conversions of energy, beginning in the steam-boiler furnace of the driving machinery. All the potential energy of the coal that is made available by the series of operations appears in the incandescent lamp, while only a part of that of the coal utilized in gas lighting is represented in the illuminating burner. Surely, therefore, the comparison should start from the coal, which is the original store of potential energy, and not from dissimilar stages in two different applications thereof.

There would be no novelty in such a comparison, however, which has been done over and over again with, so far, no tangible benefit. M. Hoho does not quite like to start his comparison from coal to lamp in both systems, although he does so to show that he is not afraid of the result. This is his second computation, in which the conversion of energy into light is shown to be from 5¼ to ninefold in favour of electricity. He would prefer, as he says, to talk of the conversion of water power into electricity in order to show the electric light at its best; and even then, with a Niagara to draw upon, he would ask chemistry to provide a better kind of filament for his lamps. Provide him with unfailing and illimitable water power, and an ideal lamp, and M. Hoho would indeed laugh gas lighting out of existence.

All the Belgian electrician wants is a good "tap" of pure energy always available, and something that will convert it into light where required with infinitesimal loss, and then he will do good business. Unfortunately for this way of handling the question, energy is not, never has been, and never will be in demand. It is an abstraction, the conception of which has been of great service to the man of pure science; but when it is dragged into commercial discussions, it makes him who misuses it so appear ridiculous. The world wants light, heat, power, electricity, magnetism, just as it wants diamonds, sugar, jet, and coal. It will ask for "energy" at about the same era that it will demand "carbon" over the counter. Sooner or later, theorists like M. Hoho must come to a stand over the commercial question, however desperately they may try to ignore the existence of any such consideration. M. Hoho may "sentence" gas to extinction as frequently as he likes; but people who never heard of "energy" in the sense in which he uses the term, will continue to find gas cheaper than electric lighting. When he babbles of "energy" and means light, he compels us to imagine how a chemist would fare if, when asked by his wife for diamonds, he should offer her a piece of black-lead with the assurance that it was essentially the same thing. Abstractions are for the abstract, and cannot be confused with the concrete except at the bungler's peril. Papers like that of M. Hoho are interesting enough so far as they go, and so long as they are confined to their proper region. When used in an inappropriate sphere, however, they strike a critic chiefly by their incongruity of terminology and object.

NOTES.

An American Gasholder Patent.

A curious method of constructing gasholders and tanks has been devised and patented in the United States by Messrs. Augustus Newell, of Chicago, and Cyrus Kehr, of Winnetka, Illinois. The invention consists of an annular metallic tank to contain a gasholder of the ordinary form and construction; and the improvement claimed appears to be in making a loose lid to the inside of the tank, to drop over the inner ring exactly in the same way as a common coffee tin is capped. It is remarked in the patentees' specification that when this interior space is covered with a riveted roof, the amount of riveting is considerable; and this labour they claim to save. As, however, they patent a modification in which a cup, exactly as in an ordinary telescopic gasholder, is made upon the upper rim of the inner ring of the annular tank, in order to act as a seal for their loose lid, it is difficult to perceive where the economy is to come in. An elaborate system of tension rods, with tightening screws, is shown in the patent drawing, as connecting the moveable tank lid with the sides of the annular tank; but where the pressure is to come from that is to be met in this way, does not appear. The patentees describe a water-sealed manhole, designed to give access to the interior of the holder from the top of the annular tank; but seeing that the holder must be emptied of gas before it can be used, it remains to be explained how such a manhole is superior to a simple bolted plate covering a hole in the crown of the holder. Altogether the patent seems to be noticeable more as a curiosity of the United States Patent Office than on account of any merits in the "invention."

A Cement for Cast Iron.

For the repair of castings forming parts of gas-stoves, which are often broken by carelessness in handling during transit, &c., experiments may be hopefully made with a cement which is recommended by some cast-iron fitters. A mixture is made of equal parts of sulphur and white lead, with about one-sixth proportion of borax; the three ingredients being thoroughly incorporated together so as to form an apparently homogeneous mass. When the cement is to be used, it is wetted with strong sulphuric acid; and a thin layer is placed between the surfaces to be joined, which are at once pressed tightly together. In five days the joint will be perfectly dry, and all traces of the cement will have disappeared, the work merely retaining the appearance of having been welded. In a very short time the joint so made will be strong enough to withstand the blow of a sledge hammer. Gas companies lending gas-cooking stoves on hire are more and more depending upon cast iron, because of the cost of the constant repairs required for sheet-iron stoves; but the drawback to most cast-iron stoves is the brittleness of the material unless the articles are made very heavy. The cement above described is said to be used by makers of coal stoves and grates; and it should therefore be perfectly harmless and suitable in every way for gas-stoves.

Portland Cement for Anchoring Bolts in Stone.

Engineers contemplating the fixing of holding-down bolts for gasholder framing, steam-engine beds, &c., will find information in a series of experiments recently reported in the Troy (U.S.) *Polytechnic*. It appears that certain gantry-work for an elevated railway had to be constructed upon rock so near the surface as to necessitate anchoring the foundation bolts; and some more durable and cheaper way of doing this than by the use of sulphur or lead being desired, Portland cement was suggested and tried. No records exhibiting the adhesive strength of cement in pounds per square inch could be discovered; and hence it was decided to investigate the matter specially. For this purpose fourteen holes were drilled in a ledge of solid limestone, one-half of them being 1¾ inches and the others 1⅛ inches in diameter, and all 3½ feet deep. Seven ¾-inch and seven 1-inch bolts were prepared, with thread and nut at one end and jagged at the other for a length of 3 feet 6 inches. There were no heads to these bolts; nor were they swelled. Four of them were anchored with sulphur, four with lead, and six with neat cement; both sizes of the bolts being used equally. All were allowed to stand for a fortnight after setting, when a lever of sufficient power was rigged, and they were pulled. In sulphur three bolts out of four developed their full strength of 16,000 lbs. and 31,000 lbs. respectively. One 1-inch bolt failed by drawing out under a strain of 12,000 lbs. In lead also three out of four bolts developed their full strength as above; but one 1-inch bolt drew out under a pull of 13,000 lbs. In the cement five bolts out of six were broken without drawing out. One 1-inch bolt began to yield in the setting at 26,000 lbs.; but it sustained the full load for a few seconds before it broke. While this experiment demonstrated the inferiority of cement both as to strength and ease of application, it did not give the holding strength per square inch of area. To determine this, limestone blocks 12 inches thick were prepared, with holes for bolts drilled clean through them. Holes 1¾ inches in diameter were prepared for 1-inch bolts, and 2¾-inch holes for 2-inch bolts. Some bolts were cemented into these holes plain and smooth, while others had screw-threads cut upon them. The specimens were allowed to stand for thirteen days; and they were then pulled in a standard testing-machine. The smooth 1-inch bolt began to yield at 20,000 lbs.; and the threaded one at 21,000 lbs. The 2-inch smooth bolt began to give at 34,000 lbs.; and the threaded one, at 32,000 lbs. In these tests the pressure was applied very gradually. When the pump was run at a greater speed—to represent a more sudden strain coming upon the bolts—the stones split before the bolts yielded. It was thus ascertained that the English Portland cement used was more reliable, stronger, and easier of application than either lead or sulphur for the purpose; and that its resistance as a setting for holding-down bolts is from 400 to 500 lbs. per square inch of surface in actual contact. Moreover, not much appears to be gained in a long bolt by jagging or threading the embedded shank.

Local Government Board Provisional Orders.—Circular-letters have just been sent by the Local Government Board to all Sanitary Authorities as to the mode of applying for Provisional Orders under the Public Health Act, 1875, and other Acts—among them being the Gas and Water Works Facilities Acts. The Board state that they deem it desirable to follow the practice of previous years, and to fix a day before which all applications for Orders must be made, if it is wished that the Orders should be confirmed during the session of 1891. The necessity for this course is the more urgent as the Board have received an intimation from the Chairman of the Committee of Ways and Means in the House of Commons that it is his intention to move, early in the next session, a sessional order providing that no Bill to confirm Provisional Orders originating in the House of Commons shall be read a first time after the Whitsuntide recess. The Board have accordingly determined that all such applications must be received by them not later than the 30th of November next, subject to this exception—namely, that where the application is for an Order to put in force the compulsory powers of the Lands Clauses Consolidation Acts, and the advertisements were not published until November, the application may be received not later than Dec. 21,

COMMUNICATED ARTICLES.

THE VALUATION OF GAS-WORKS FOR ASSESSMENT.

By Thomas Newbigging, M. Inst. C.E.

IV.

We shall now proceed to give a practical example of the method of valuing a gas-works for assessment; and for this purpose will summarize the year's revenue account of an actual company.

The following necessary particulars are premised:—

The capital account stands at £65,000.

A structural valuation of the whole works, including the mains, amounts to £57,000.

The structural value of the works, or manufacturing station only, is £38,000.

The gas production for the year is 100 million cubic feet.

The year's gas consumption is 92 million cubic feet.

The maximum daily make of gas is 540,000 cubic feet.

THE ..... GAS-WORKS.

Revenue Account.

Year Ending 18 .

(Fractions of a £ are omitted.)

Dr.		*Cr.*	
To Coal	£5,250	By Gas-rental	£13,800
Purifying materials	173	Meter-rents	317
Wages	1,206	Residual products	2,740
Salaries	1,172	Profit on gas-fittings	141
Repairs and maintenance	1,560		
Rates and taxes	920		
Stationery, printing, &c.	68		
Miscellaneous and law expenses	221		
Balance	6,428		
	£16,998		£16,998

THE ..... GAS-WORKS.

Computation of Value for Assessment to the Poor, Based on the Working for the Year ending 18 .

RECEIPTS—		
Gas-rental		£13,800
EXPENDITURE—		
Coal	£5,250	
Less residuals	2,740	
	£2,510	
Purifying materials	173	
Wages	1,206	
Salaries	1,172	
Repairs and maintenance, 92 million c. ft. of gas sold, at 4¼d.	1,725	
Rates (rateable value £3000, at 5s)	750	
Stationery, printing, &c.	68	
Miscellaneous and law expenses	221	
		7,825
Net receipts		£5,975
WORKING CAPITAL—		
Working expenses: five months' expenditure—*i.e.*, 5-12ths of £7825	£3,260	
Six weeks' stock of coal, calculated on the maximum daily consumption, 2260 tons, at 10s. 6d.	1,186	
Sundry stores	500	
Tools and implements	300	
Office and laboratory furniture	300	
Meters on hire	2,750	
One quarter's rent	1,083	
Tenant's capital	£9,379	
Interest on tenant's capital at 5 per cent.	£469	
Trade profits on do. at 10 „	938	
Risks and casualties on do. at 2½ „	234	
Occupier's or tenant's share		1,641
Gross estimated rental		£4,334
STATUTABLE DEDUCTIONS—		
The sum which, set aside annually and invested at 3½ per cent. compound interest, will reproduce £57,000, the structural value of the buildings, apparatus, plant, and mains, at the end of 30 years	£1,145	
The sum which, set aside annually and invested at 3½ per cent. compound interest, will reproduce £3350, the value of the chattels, at the end of 18 years	139	
Insurance on £10,000 at ½ per cent.	50	
		1,334
Rateable value of the whole		£3,000

APPORTIONMENT.

Rateable value of the works, or indirectly productive portion, £38,000 at 4 per cent.	£1,520
Rateable value of the mains or directly productive portion	1,480
Rateable value of the whole	£3,000

Total Receipts for Gas.		Receipts for Gas in Township.		Rateable Value of Mains.		Rateable Value in Township.		Name of Township.
As £13,800	:	£8,196	::	£1,480	:	Mains . £ 879 Works . 1,520		
						£2,399		A.
As £13,800	:	£3,904	::	£1,480	:	Mains . 419		B.
As £13,800	:	£1,700	::	£1,480	:	Mains . 182		C.
		£13,800				Total . . .	£3000	

For the purpose of making the foregoing valuation clearly understood, we will now proceed to make such remarks upon it as the circumstances seem to require.

RECEIPTS.

The *Gas-Rental* includes both the private consumers' accounts, and those for the public lighting. Some valuers include *Meter-Rents* in the amount of the gross receipts; whilst others exclude them. Both cannot be right. As a matter of fact, they should not be included. The meters do not belong to the hereditament, but are chattels. This has been settled by the decision in the case of *Regina v. The Parish of Lee;** and therefore the rent, if any, arising from their use by the consumers should not be included in the profits of the hereditament. The tenant has to provide the meters, or the capital for them; and therefore the rents for the hire of them should not be included in the gross receipts to find the rent of the hereditament which belongs to the landlord.

Instead of classing the receipts for the *Residual Products* among the gross receipts, it is proper to deduct them from the cost of the coal on the expenditure side of the account. The residuals, as a rule, are paid for monthly; whilst a proportion of the coke is sold for ready money. The effect of deducting the amount of the residuals from the cost of the coal, is to reduce the proportion of the expenditure claimed by the tenant as working expenses. The deduction does not affect the net receipts.

The *Profit on Gas-Fittings* is not an item to be included among the gross receipts, because (like meter-rents) it is a source of income apart and distinct from the earnings of the hereditament. The same remark applies to other subsidiary items of income that frequently appear in the revenue account.

EXPENDITURE.

Turning now to the other side of the account, the first item is that of *Coal* (or *Coal and Cannel*, as the case may be). This usually includes not only the actual cost of the material, but also the cost of haulage (if any), stacking, and trimming. The income from the residual products, coke, tar, ammoniacal liquor, is deducted from the cost of coal for the reasons already stated.

Purifying Materials.—From this item should be deducted the proceeds from the sale of spent lime, if any.

Wages.—These are mainly for retort-house and yard labour.

Salaries.—In this item are included the salaries of the engineer, manager, and secretary; those of the office clerks, the collectors' salary and commission, if any; and the directors' and auditors' fees. Objection is sometimes raised to the directors' fees being taken into account, on the ground that these would cease to be paid if the works were let from year to year. That is true; but, on the other hand, it is right to assume that the amount ought fairly to go to the tenant by way of salary, in addition to his trade profits, for the personal supervision he would have to bestow on the works.

(*To be continued.*)

A REVIEW OF A CRITICISM.

By W. Gadd, C.E., F.R.M.S.

In the JOURNAL for July 15 last, there appeared what purported to be a criticism of the paper read by the present writer at the Ryde meeting of The Gas Institute. This has already been commented upon in its more personal aspects, in the correspondence resulting; but, as probably there are a few persons who may be influenced, to some extent, against the new departure in gasholder construction by that criticism, it is only due to the author to review the same from a point of view mechanical.

Apart from the bad form displayed by the indulgence in sneers at the—purely imaginary—scientific training or knowledge, or the want of it, possessed by the originator of the new system, such a mode of criticism is a very inconvenient one for the critic himself; inasmuch as, when such a person has once unfortunately taken up a position so high and infallible, it becomes the more difficult and humiliating for him to climb down again. The object of the present communication is to openly and frankly deal with the remarkable objections raised by the critic to the "method" of demonstration

* *Regina v. Lee*, L. R., 1 Q.B., 241; 35 L. J. M. C., 105.

adopted in the paper, and the results thereof; scarcely, however, with the hope that, when this is honestly done, a frank expression of the errors—which have undoubtedly been made—will be forthcoming, for an evident, though minor error, which has twice been referred to in the correspondence raised, has not yet been in any way acknowledged except by silence.

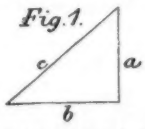
In the first place, it has to be observed that the critic seems to have started out with the idea that the paper in question was intended to controvert or "confute the principles hitherto held by properly-trained engineers," and in particular was aimed at something he himself had written on gasholder construction. No one was more astonished than the present writer to find such a suggestion made in a serious journal, as nothing was further from his mind than a Quixotic tilt at the laws of Nature, on the one hand; while on the other, he unfortunately has not yet been able to indulge in the pleasure and profit which a perusal of Mr. Cripps's book would possibly give, and therefore could hardly have had in mind what he, even yet, knows nothing of. Nevertheless, it is just possible this fact may account for the sad deficiency in training which the critic seems to think he has discovered. Any way, these ideas existing most probably produced that personal bias which the critic carried to such excess.

Very much of the criticism under review was immaterial, and can only be regarded in the light of so much "padding"—notably the whole of those portions which "read into" the original paper ideas and implied statements, which it neither contained nor intended. These are difficult to get hold of, and have already been pointed out. On the other hand, the few clear statements by the critic—not "proofs" by any pretence, but statements on mere personal authority—can perhaps be fully investigated. As the chief example of these, the critic makes a clean-cut assertion, subsequently repeated in the correspondence, admitting of no prevarication whatever, that the author had only taken the *vertical* force of *one side* of the holder, and divided this amongst the whole of the eight rollers. It must be admitted by all, including the critic, that this is the central idea of the criticism, which, if it be not true, must break down the whole of the elaborate fabric raised around it. Is it true? We will see.

The original paper gave an error of figures, which has been fully and frankly acknowledged and corrected. But the critic makes his statement quite irrespective of this error; for he first made the necessary objection to the figures, and *then* demanded that the force deduced should be considered as only half the requisite amount. On reference to the original paper, it will be seen that the force alluded to is defined therein as the "*total* verticial force." Now if it *be* in reality the total force, it *must* be divided between the two sides, for there can be no force created except that which is evolved or derived from the initial horizontal wind force; and there were, in the "method" employed, *two* (not eight, by the way) resisting points thereto. The method adopted in the paper was based on the time-honoured one of triangulating the forces. It is true, in one sense, this is a "superficial" method; but it is a sound one all the same.

In any triangle of the forces—say *a*, *b*, *c*—the *total* forces are

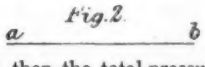
Fig. 1.



enclosed. If *b* be the total horizontal force, *a* will be the total vertical force, and *c* the total diagonal. The critic, one would think, did not observe in his haste, that the vertical force was totalized, always assuming he was clear in his understanding of the "method," and at the same time was not desirous to confuse matters.

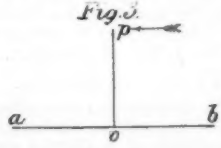
If we take a line *a b*, representing a horizontal force, resisted

Fig. 2.



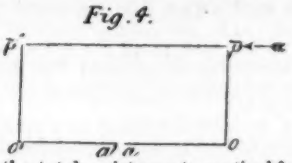
at *b*, and equal to *X*, then the total pressure on *b* is *X*; and *no* vertical force is evolved. But if we fulcrum a bar *a b*, at *o*, and raise a leg *o p*, at right angles, equal to *a o* and *o b*, then apply our horizontal force *X* at *p*, we develop a vertical force

Fig. 3.



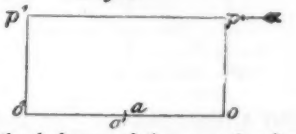
at *a* and *b* respectively of $\frac{X}{2}$ in opposing directions. This gives us $\left(\frac{X}{2}+\right)+\left(\frac{X}{2}-\right)=X$ —the *total* vertical force, which, with the equal leverage shown, balances the horizontal force. Half the vertical force is resisted on *one* side, and half on the *other*. Again, if we place two equal lever legs at right angles, as *o p* and *o a*, and two others opposed as $o^1 p^1$ and $o^1 a^1$, and connect the same together by link rod $p p^1$, and apply at *p* our force *X*,

Fig. 4.



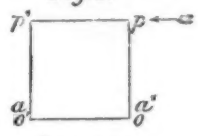
we again divide the total resistance to vertical force at *a* and a^1, in opposite directions, as in the former case; and further, if a^1 and *a* be made to coincide as in fig. 5, we engender a neutral

Fig. 5.



point there by the balance of the opposing forces. From the critic's remarks, this may be judged to be the place where he became confused, not observing that this operation also transfers the action of the vertical force to *o* and o^1, in two halves, with twice the leverage of resistance. That is to say, the leg $o^1 p^1$ is resisted by the long leg $o^1 o$; and the leg *o p* is resisted by *o* o^1. Hence, in a system like unto the figure, where the points of resistance *o* and o^1 are twice the distance apart of the vertical legs at right angles, we get a vertical force upward at point *o* of $\frac{X}{4}$, and a like vertical force downward at o^1 of $\frac{X}{4}$; or, if we cause the two legs to overlap each other, so as to bring the leverage again equal, we get *X* horizontally applied at *p*, equal

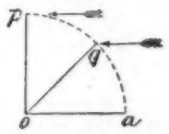
Fig. 6.



to $\frac{X}{2}$ vertical at *o* and o^1 respectively. In such and every case the same result ensues—viz., $\frac{X}{2}+$ on one side, and $\frac{X}{2}-$ on the other side. But lest our critic should again be tempted, in his haste, to further indulge in such rodomontade regarding the author, as that "here he is lost in vague, inaccurate, and misleading method, altogether foreign to all the known principles of mechanics," we will check off the foregoing plain mechanical demonstration with another.

1. "Horizontal force delivered to one leg of a lever placed at right angles to the second leg, exerts the maximum power thereon.
2. "The same force delivered at any angle less than a right angle, exerts a power on the second leg in the proportion of the *sine* to the *cosine* of the angle subtended by one leg to the other"—*e.g.*

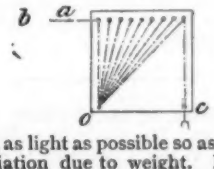
Fig. 7.



A force *X* applied at *p*, horizontally, gives a vertical lift at *a* of *X*. But the same force applied horizontally at *q*, where the leg subtends an angle of 45°, gives a vertical lift of $\frac{X}{2}$; the remainder of the force being otherwise disposed of, or resolved.

The whole of the foregoing demonstrations have repeatedly been, and may readily again be tested by experiments, either by "properly trained engineers," or ordinary mechanics; and a very simple experiment will demonstrate the result of force delivered at an angle, as being a very elementary fact in Nature. But it may be as well—some old fellow-students being probably alive—to interject that as this same experiment was employed in class over 30 years ago, by perhaps *the* most eminent professor of civil and mechanical engineering of the century, it is not put forward in any sense as original. It nevertheless completely illustrates angularly applied force. Get a square of

Fig. 8.

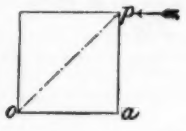


thin wood or metal, as light as possible so as to eliminate as much as may be the vitiation due to weight. Mark this out in any number of angles to 45° from one corner, at which it is fulcrumed, making holes in the line for the attachment of a cord,

Now attach this cord *a* to a light bell-cranked steelyard, or spring balance (say) at *b*; also hang a weight at *c*. Then make the attachment of the cord to all the holes in succession, by lengthening or shortening as required, and note the varying weight necessary to balance the constant at *c*, or *vice versâ*, when using a constant at *b*.

Now, a force *X* horizontal, exerted on a square at the height of one of its sides, as in Fig. 9, being delivered at an angle of

Fig. 9.



45°, will only exert a lifting force of $\frac{X}{2}$ on that side, because the *sine* of the angle is equal to the *cosine*. Hence, by two distinct processes of mechanical reasoning, backed up by experiments available to the most ordinary mechanic, the triangle of the forces is vindicated; and it is proved to demonstration—not on mere authoritative assertion—that *only half* the *total* generated vertical force can be exerted on one side of a holder, or any other cantilever structure supported solely at the base, when subjected to a horizontal force applied to that side.

The writer is of opinion that the critic, relying on ordinary formulæ for cantilevers, in a case where they cease to apply in strict form, did not stop to refer to the underlying principles of mechanics on which these formulæ are constructed. This is the more possible, because in ordinary cantilevers which have a height generally much greater than the base, the *sine*

Fig 10.

of the angle subtended so nearly approaches unity, that it may and ought to be treated as *radius*. The author was told, with the impressiveness of italics, that "the pressure on the various points depends on their respective distances from the neutral axis of the system." It is devoutly to be hoped they will continue so to do; and that also two and two may never be guilty of making more than four. One is inclined to say with the Dominie, "Prodigious!!"

The totalizing of the wind force is a *convention;* and so, therefore, must be the resistance. In *reality*, the wind force on a *circular* cantilever takes the least effect (by lateral angular delivery) where there is the least resistance, until, at the point assumed neutral by the critic, there is only the effect of friction operating. With an elastic body like a gasholder, such as at Northwich, *all* the rollers get under strain; whereas if it were *perfectly rigid* there never could be more than *two* rollers on each side which could take up the *vertical* resistance, especially as a reasonable amount of play is allowed.

It is not intended, on the present occasion, to enter into other than the essential points of this remarkable criticism; but this article would hardly be complete without a reference and refutation of the wretched paragraph on the *plus* and *minus* signs. These were used in the original paper, as they have been used in the present article, and as they will be continued to be employed by far more competent persons. On this head one cannot do better than refer to a small but valuable text-book on "Elementary Trigonometry," written by Professor Hamblin Smith, and now largely used in the colleges. The reader is directed to page 26, chapter 5, "On the use of the signs + and — *to denote contrariety of direction*." The use of these signs, made by the critic, when depicting the *state* of the *material* under strain, is all right enough for its purpose; but that was not the purpose of the author, neither would it be suitable for enabling a demonstration of the *amount* of resistance to be made, as it stood. There are many legitimate and helpful uses of the signs other than the one the critic has learnt.

The whole of the foregoing ought to be as familiar as household words to a "properly trained engineer," as it is to most ordinary mortals in the profession; but it is no portion of the present writer's desire to call names, attribute gross ignorance, or indulge in such modes of defence against the like action. He rests content to point out the horns of the awkward dilemma. If the critic *did* know these elementary things, how came he to write what he has published?

Mr. Alderman J. Varley, of Huddersfield, died last Saturday week, at the age of 53. He was a prominent member of the Corporation Gas and Water Committees; and on the former his knowledge of the coal trade was of special value in considering the contracts.

TECHNICAL RECORD.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The Twenty-sixth Half-Yearly Meeting of this Association was held last Tuesday, at Bristol. A large party of the members first visited the gas-works at Stapleton Road, where they were hospitably received by Mr. D. Irving, the Resident Engineer, and his assistants. The business meeting was afterwards held at the Royal Hotel; the President (Mr. John J. Jervis, of New Swindon) occupying the chair.

General Business.

The notice convening the meeting was read by the Honorary Secretary (Mr. Norton H. Humphrys, of Salisbury); and the minutes of the last meeting were then adopted, on the motion of Mr. H. F. Willey, of Exeter, seconded by Mr. H. Sainsbury, of Trowbridge.

Mr. T. W. R. White, of Sherborne, moved that the first thing taken on the *agenda* should be the proposed alteration of the rules. This having been seconded by Mr. S. W. Durkin, of Southampton, and carried, Mr. White proceeded to propose an alteration in Rule 4. Instead of the Past-Presidents for the preceding three years being *ex-officio* members of the Committee, he proposed to make all Past-Presidents members of the Committee, by striking out the words "for the preceding three years." He said that the Committee were widely scattered through the district—for instance, on this year's list there were places so far apart as Ventnor and Pembroke Dock; and in order to carry on the business of the Association, it had been necessary to secure a full attendance of Past-Presidents. The Committee unanimously recommended this alteration. Mr. Willey seconded the proposition, which was carried.

Mr. White next moved an alteration in Rule 24. As the rule stood, he said, it provided that all voting papers should be presented personally at the annual meeting; but he considered it very hard that absence from the meeting should cause the loss of the right to vote. Many who were, no doubt unavoidably, prevented from being present that day had a warm interest in the Association, and felt it a hardship to lose their vote. He therefore proposed to strike out the word personally. The motion was seconded by Mr. Willey, who observed that he had himself raised this point three years ago. After some discussion, in which Messrs. Sainsbury, Irving, and Brinkworth took part, it was agreed that the words "sent under cover to the Secretary" should be substituted in the rule for "presented personally."

The Honorary Secretary next read the statement of accounts for the past year, which had been duly examined by the Auditor, Mr. J. Nicholls, of Crewkerne. Mr. Nicholls was unable to be present; but he sent a telegram, calling attention to the large amount owing for subscriptions. Mr. White proposed that the accounts be accepted. This was seconded by Mr. R. Beynon, of Torquay, and carried.

The election of officers for the ensuing year was next proceeded with. Mr. J. H. Gray, of Weston-super-Mare, and Mr. Sainsbury volunteered to act as Scrutineers; and they announced the result of the voting to be as follows:—

President—Mr. S. W. Durkin, of Southampton.
Vice-President—Mr. D. Irving, of Bristol.
Hon. Secretary—Mr. N. H. Humphrys, of Salisbury.
Auditor—Mr. J. Nicholls, of Crewkerne.
Members of Committee—Mr. W. Davis, of Poole, and Mr. S. Bark, of Godalming.

Mr. Willey observed that Mr. R. Ashton, of Barnstaple, was the Vice-President last year; and it was usual to offer the presidency to the retiring Vice-President. He asked why this had not been done in the present instance. The Honorary Secretary read two letters from Mr. Ashton, in which he declined to stand as President. Mr. Willey said that, as a personal friend of Mr. Ashton, he knew that gentleman occupied several public offices, and he therefore could understand that he was unable to accept the presidency. Mr. Durkin and Mr. Irving briefly acknowledged their election.

It having been decided that the next meeting should be held at Southampton, the following gentlemen were elected members of the Association, on the motion of the President seconded by Mr. White: Mr. H. Townsend, of Plymouth; Mr. P. Thomas, of Wellington; and Mr. J. Ely, of Abingdon.

President's Address.

The President then delivered a few opening remarks. He said he had followed up the matter discussed at the last meeting—viz., the management of a district gasholder without a special trunk main. His suggestion to fill the holder from the town mains was not then generally approved; but Mr. Haddock, of Warrington, had since volunteered the information that he was successfully filling a district holder in this way—using an old boiler, 18 ft. long by 6 ft. diameter, as an anti-pulsator. The main was 16 inches in diameter; and there was a 6-inch connection to the exhauster. The usual day pressure was 12-10ths; and there was no annoyance to consumers. Mr. Jervis went on to direct attention to photographs of the new gasholder erected

at the Great Western Railway Gas-Works at Swindon, without guide-framing to the upper lift, which was inspected by the Association after their last meeting. Passing on, he mentioned Mr. Cloudesley's patent cash index, which was applicable to all kinds of gas-meters. He also expressed the hope that members would not fail to bring forward at the meetings of the Association anything of a novel character that might be interesting, even if not of sufficient importance for a paper; and he suggested that a small Committee might be formed for the purpose of collecting information of this nature.

Mr. J. Faulkner, of the Great Western Railway Gas-Works at Swindon, then replied to several questions about the gasholder. It consisted, he said of two lifts, each 33 feet high—the outer one 104 feet in diameter, and the inner 102 feet. The outer lift gave 55-10ths pressure, and the inner one 38-10ths; making together 93-10ths when the holder was cupped. The total weight was 179 tons. No very high wind had yet occurred to test it; but it worked regularly and evenly, the rollers engaging smoothly to the guides when descending. The top rollers had a slight play—about ¼ inch. Mr. White thought it would add to the appearance of the holder, without altering its working, if the top rollers were fixed on the guides, instead of on the upper lift. Fender plates could easily be fixed for the holder to work on.

Cloudesley's Cash-Value Indicator for Gas-Meter Indices.*

Mr. J. L. Cloudesley gave an interesting description of his cash index for meters, which, he said, could be added to any meter at a cost of about 2s. 6d.; and if the price of gas was altered, a fresh index-card could be placed in in a few moments. There was great difficulty in getting ordinary consumers to understand the working of a meter; and his arrangement was so simple that it could easily be read by anybody, and would therefore remove the suspicion with which the meter was generally regarded. Mr. Willey said that, as a practical meter maker, he did not approve of further machinery being added to it, as every addition increased the pressure at which the meter would work. Apart from this, Mr. Cloudesley had described a very simple and convenient arrangement. He thought anyone could learn the ordinary way of reading meters in a few minutes. Mr. White remarked that he welcomed anything that would simplify the meter reading and computation of gas accounts. He had successfully introduced prepayment meters at Sherborne, and believed them to offer an effective way of meeting the competition of oil. Mr. Cloudesley said the question of friction was inconsiderable. There were only three additional wheels working very slowly; and they would not appreciably increase the pressure required to work the meter.

Notes on Purification.

Mr. S. W. Durkin followed with a paper entitled "Notes on Purification." He said that in touching upon the subject that was now known as the air process, he rather offered confirmatory evidence of what others had done, than anything novel in itself. He did not attempt to dive into the intricacies of the subject, but would simply give the result of twelve months' experience. The air was drawn in at the outlet of the hydraulic by working the exhauster at a vacuum, and passed through a horizontal pipe condenser, rotary washer, scrubber, and dry scrubber, with the gas, before reaching the purifiers. It was passed through a meter; the intake being read every hour, and adjusted, if necessary, by a regulating cock. There were seven purifiers, each 32 ft. by 20 ft., of which four were used for lime, and three for oxide. A table indicating the results of working during the first half of 1889 without air, and during the corresponding period of 1890 with an average of 1·85 per cent. of air, was given. The result showed that about the same number of lime purifiers were needed, but only two changes of oxide boxes, against 23 without air. On the whole, there was a reduction of one-third in cost of labour. The sulphur compounds, which formerly ranged up to 40 were kept down to 16½ grains, by the use of air. The additional vacuum reduced the deposition of carbon in the retorts, also the choked pipes; and besides the reduction of sulphur compounds, there was the saving in nuisance due to the lesser number of boxes changed. The use of air necessitated some extra attention; and he had to thank his works assistant, Mr. Frank Durkin, for care in this respect. The lime increased in temperature; and consequently water was driven forward into the receivers, or else to the bottom of the oxide boxes, from which it could be removed as often as necessary. He exhibited some samples of spent lime to the meeting.

Deodorizing Foul Lime.

A paper, comprising a description of a process for deodorizing foul lime before removing it from the purifier, was read by Mr. R. Beynon, of Torquay, who in bringing it forward disclaimed any idea of exclusive originality. Attention to the subject was forced upon him by complaints of nuisance caused by the foul material thrown out of the purifiers at his works. He had four purifiers, each 20 feet square by 5 feet deep. A line of 8-inch pipes was laid, with a tee-piece for each box, fitted with a stuffing-box, sliding connecting piece, and blank flange; so that any purifier could be connected or disconnected to it at will. On this line of pipes there was a Körting's steam ejector, beyond which the pipe was continued for some distance to act as a condenser; and it finally terminated in the inside purifier belonging to the sulphate plant. As soon as a purifier was shut off, the cover was lifted till it was a clear inch above the water seal. The 8-inch pipe was connected by means of the sliding piece, and a flange pipe on the purifier; and the ejector was worked so as to draw a slow stream of air through the material. At first the lime heated, but the process was continued till it was quite cool, which occupied 72 hours or so. This system of working effectually prevented any complaints of nuisance.

The two papers summarized above were then discussed together. Mr. J. H. Cornish, of Bridgwater, said he tried the air system some years ago, using a cock worked by a lever attached to the exhauster throttle valve. But one night the latter arrangement got hooked up, and too much air was admitted, thus spoiling the gas. It was then discarded. Mr. N. H. Humphrys said his experience was very similar to that described by Mr. Durkin. He gave a full account of what he was doing in a paper read at the meeting of The Gas Institute last year, and was still following the system then described, with satisfactory results. He was not particular whether the oxide or lime purifier was placed first. Mr. White said that in small works they could not carry out things exactly as in larger ones. At his works a little oversight with the air-cock would mean a lot of mischief. He also thought that some of the advantage claimed for the air system was really due to improved washing and scrubbing. He preferred to have the lime purifiers first, and thought the oxide was much assisted thereby. He knew of some small works where the air process had led to great difficulty. Mr. Sainsbury said he had felt afraid to venture on the air process; for they all knew the effect of accidentally introducing a little air. He preferred to use the lime after the oxide, as he thus avoided nuisance. The President said he used air successfully, admitting it at the exhauster inlet through a dry meter and ¾-inch pipe; and to avoid the effects of back pressure, he used a silk valve. With air, his purifiers ran six times as long. Mr. Durkin, in reply, said he considered that the action of the air on the lime was the means of avoiding nuisance. Formerly he had been troubled with complaints as to the effluvia from a heap of foul lime; but since using air there was no complaint. He thought the foul lime would not be of any use at all for reducing sulphur compounds; and he also mentioned that the use of too much air had been found to have the effect of driving the sulphur forward, but a moderate amount would reduce the sulphur compounds. The illuminating power of his gas was not prejudiced by the air process. He had no difficulty in selling the spent lime at present.

Hydraulic and Foul Mains.

Mr. Norton H. Humphrys read a paper comprising descriptions of recent designs of hydraulic and foul mains prepared by himself. He said that his paper had been hurriedly written as a stop-gap, on account of disappointment in respect to a paper promised for this meeting; and it included matter that was scarcely ripe for publication, as his experiments and observations in connection with it were not yet complete. The hydraulic main and condensers had frequently received attention at meetings like the present; and it was generally agreed that the condensation should be gradual, and that the contents of the hydraulic should be thin and as fluid as possible. In regard to the first condition, the foul main round the inside of the retort-house appeared to be generally adopted; but there was no special rule as to its size. The obvious intention was that it should be large enough to admit of a very slow rate of travel—so slow that even the lightest particle of solid or of vesicular matter would not be carried forward, but be able to gravitate to the bottom of the pipe, and also to leave some appreciable time for the transit of the gas through the pipe, so that the temperature would fall to a moderate extent before the outlet end was reached. Assuming that the rate of travel should not exceed 12 inches per second, and that the gas should occupy two minutes in passing through, a proper size for a make of 144,000 cubic feet per diem would be 120 feet of 19-inch pipe. This, however, was merely given by way of illustration, as he believed the proportions might be exceeded with advantage. It was a common practice to "flush" the hydraulic with ammoniacal liquor, in order to wash out pitchy or viscous matters; and it had occurred to him that a foul main of ample size, laid with a decided fall towards the inlet, so that the whole of the condensed matter would flow back into the hydraulic, would be a good thing. Thin tar and water would thus be added to the contents of the hydraulic. The former was known to exercise a powerful solvent influence on thick pitchy matters; and the latter floating on the surface of the tar would aid in maintaining a water-seal. The whole would pass off together through the hydraulic overflow; and the more rapid current would maintain a gentle flushing action right through to the tar-well. The arrangement also possessed other advantages; but it was only intended for small works and not for large ones, having several different sections of hydraulic. A description was next given of foul mains on this principle erected at the gas-works at Wilton and Westbury. Both of these were in operation with satisfactory results. They were so proportioned as to give the gas a velocity of something less than a foot per second. The paper concluded with a description of a new arrangement of

* This meter attachment was fully described and illustrated in last week's JOURNAL, p. 542.

hydraulic and overflow arranged for a bench of three beds of fives at the Salisbury Gas-Works. The overflow consisted of a shallow syphon, a bridge-valve, and a seal-box. Every part, it was stated, could be cleaned, if necessary, without interfering with the make of gas; and the apparatus could also be used for flushing—the whole contents of the hydraulic being emptied out when desired.

The President said he thought the members had heard a most interesting paper, of which the principal feature was the fall back to the hydraulic. There was no doubt but that the thinner tar would dissolve the thicker. Mr. Durkin said the arrangement for running the fluids in a direction opposite to the flow of gas might work inside the retort-house; but he knew from experience it would not do outside. He found this with a horizontal condenser, which always got choked. Mr. Sainsbury remarked that he had always laid his foul main in the opposite direction; but he saw the advantage claimed, and thought it would help to keep the hydraulic clear. Mr. Beynon said he had read that the liquids flowing against the gas would cause stoppages. He had at his works a large foul main; but he was obliged to vary the level at different parts. Mr. White stated that he preferred separate sections of hydraulic to each bed, with distinct gas outlets leading to a collecting main. He had a large foul main; and found it a great advantage for the gas to travel at a slow speed, inasmuch as it improved the illuminating power. Mr. Irving considered that the size of the foul main was somewhat overdone, though he would not advocate a small foul main. He believed in gradual condensation, and in periodically flushing the hydraulic. In addition to the advantage named, there was some removal of ammonia. He agreed in the desirability of separate sections of hydraulic.

Mr. D. Irving having described a drawing of his patent hydraulic bridge-valve and flushing apparatus, the President proposed a vote of thanks to the gentlemen who had taken part in the proceedings of the day. This was seconded by Mr. T. Hardick, of Salisbury, and carried. Mr. Durkin and Mr. Beynon briefly replied. Mr. White then proposed a vote of thanks to the President, which was seconded by Mr. Sainsbury, and carried with applause. The President, in response, referred to the courtesy shown to the Association by the Bristol Gas Company in allowing them to visit the Stapleton works. The Secretary of the Company (Mr. J. V. Green) having replied, a vote of thanks to the Honorary Secretary was passed, on the motion of Mr. Durkin, seconded by Mr. Hardick. Mr. Humphrys shortly acknowledged the vote, and the proceedings terminated.

FLUE GASES FROM GAS-STOVES.

At the Meeting of the Chemical Science Section of the British Association on Wednesday last at Leeds—the last day of the Session—a paper was read by Mr. W. Thomson, of Manchester, entitled "The Unburned Gases contained in the Flue Gases from Gas-Stoves and Different Burners."

The author said the only burner in which perfect combustion was effected was in a paraffin oil-lamp when the flame was not turned full on; but when the flame was turned full on, unburned gas was liberated to the extent of 12 parts of carbon and 3 of hydrogen for every 1000 parts of carbon in the oil completely burned. The next nearest approach to complete combustion was in the Argand gas-burner when the gas was not allowed to burn full on. No carbon and one-quarter of a part of hydrogen was left unburned per 1000 parts of carbon burned completely. When the gas was turned full on, 1-10th part of carbon and 2½ parts of hydrogen escaped unburned per 1000 parts of carbon completely burned. Next in point of producing perfect combustion was one of Bray's ordinary flat-flame burners burning in the open air, when 12 parts of carbon and 1 of hydrogen escaped unburned per 1000 of completely burned carbon. In a heating stove with three luminous flat-flame burners, 97 parts of carbon and 12 of hydrogen escaped unburned. In a stove where eight Bunsen burners played on fancy ironwork in front, 146 parts of carbon and 7 of hydrogen escaped combustion. In a stove in which asbestos projecting from a fireclay back was heated by twenty Bunsen burners, 57 parts of carbon and 20 of hydrogen escaped combustion; and in a stove in which the burned gases rise to the top of an iron chamber, and pass into the flue from the bottom of the chamber after giving its heat to tubes set in the chamber through which cold air passes to be heated, as much as 226 parts of carbon and 28 of hydrogen escaped combustion per 1000 parts of carbon completely burned.

In the course of the discussion on the paper,

The President (Professor T. E. Thorpe) said that an extremely small quantity of carbonic oxide in an atmosphere breathed by people was very dangerous. He spoke with some knowledge and experience of this fact. Some years ago he was nearly killed by carbonic oxide. He was called to see a man who was found lying in bed in a small room 10 feet square; and from his appearance it seemed to be highly probable that the man had been poisoned by carbonic oxide. He (Professor Thorpe) attempted to reproduce the conditions in the room by setting a blowing engine at work; and after it had been going a few minutes, he entered the room and closed the door. No sooner had he got half-a-dozen steps across the floor than he fell to the ground in a state of insensibility. Luckily his friends heard the fall; and, rushing into the room, they dragged him out. As soon as he recovered, he tried to make experiments to determine the existence of carbonic oxide in the atmosphere. He got a small pigeon and threw it into the air of the room. The bird simply fluttered in a helpless way as it fell through the air; and in a moment or two it seemed to be dead. It was almost incredible to him that the bird could have taken, in so small a space of time, such a quantity of carbonic oxide that it could be detected in the blood. After some trouble, he got a little dog, and threw it into this "chamber of horrors." In less than a minute the dog was apparently dead. He had no difficulty two days afterwards in detecting the presence of carbonic oxide in a few drops of the blood of the dog. He was quite sure that this incident afforded the most certain and delicate test they could have of the presence of minute quantities of carbonic oxide in the air of badly ventilated rooms.

Dr. Jacob said that in Leeds there were thousands of people who were burning gas-stoves of all kinds; and a large number of those who inhabited the kitchens where these stoves were used, suffered from various complaints. The experiments that had been carried out by Mr. Thomson were somewhat imperfect, and might very profitably be continued further. The amount of combustion which took place in an ordinary gas-flame differed according to the pressure of the gas. Usually a burner intended to burn 3 cubic feet of gas in a given time had 5 or 6 cubic feet passed through it. Generally speaking people who paid £10 gas bills only obtained £5 of light. He had that on the authority of one of the largest manufacturers of burners. Seeing that a great many of the gas-stoves were used for cooking purposes, the experiments detailed in the paper, to be complete, should include the fumes from cooking-stoves. These were points of such great sanitary importance, that it was worth the while of the Section to investigate most carefully the chemical conditions under which gas-stoves were now so largely used in private houses.

THE HYDRAULIC COAL-TIPPING MACHINERY AT THE BARRY DOCKS.

A volume of the Proceedings of the Institution of Civil Engineers, which has just been issued to the members, includes a paper read by Mr. J. Robinson, M. Inst. C.E., on the recently erected Barry Docks, together with the discussion and correspondence thereon. The portion of the paper indicated in the above title will possess special interest for those of our readers who are directing their attention to mechanical methods of conveying coals or coke, as a means of economizing on the cost of manual labour for wheeling.

The Barry Dock is situated about seven miles to the south-west of Cardiff, and the site possesses such natural advantages as to render it likely that it will ultimately become the coaling port for the district, to the prejudice of Cardiff and Penarth. The shipment from these two ports has increased from 3 to 11 millions within the last 20 years. The works at Barry comprise a tidal basin 7 acres in area, a dock of 73 acres, and a timber pond of 24 acres. The coaling arrangements (which are shown on a drawing accompanying the paper) comprise eleven high-level tips on the north side, and eight low-level tips on the mole and on the south side of the dock. The former are said to be capable of loading 400 tons of coal per hour; but the latter would not take so much. There is provided for each of the high-level tips a separate curved branch or siding, capable of accommodating a train of 50 to 70 ten-ton waggons. All the waggons used are made to tip from one end only, as is usual in South Wales; and in the ordinary way of working, all the waggons are put on to the sidings the right way about for tipping. A turntable is provided at the entrance to each tip, however, so that in the event of a truck being by oversight put on the wrong way about, it can be turned. The full waggons are drawn up to the tip one by one, as required, by means of hydraulic capstans, passing the turntable and the weighbridge, where the gross weight can be ascertained and booked. The level of the rails is 24 ft. 6 in. above that of the quay; and the truck is received upon a cradle. This cradle is maintained in place by wrought-iron guide-framing, supported upon a strong base of masonry 30 feet square, and is carried on four cast-iron rams, by means of which its level can be easily raised or lowered as required, according to the height of the vessel or the level of the water in the dock. The rams are respectively 8¾, 9¼, 7½, and 8 inches in diameter; representing pressures of 18½, 21½, 13½, and 15½ tons. The object of this arrangement is to enable the degree of power used to be adjusted to the weight of the truck lifted or lowered; and the weight of a falling load forces water back into the accumulator—thus utilizing the falling weight. The truck is received upon a tip-up table fixed to the cradle by a hinge in front, which can be raised to an angle of 45° by a hydraulic cylinder, hung on trunnions to girders beneath the cradle. Having been received upon the table, the truck is secured with a chain at the tail end, and the catch holding the end door is struck open. It is then raised or

lowered to the desired level, and tilted so as to throw the contents into an inclined coal-shoot, extending over the ship's hatchway. It is next brought back into position, and the empty truck pushed off. It runs by its own weight down a road having an inclination of 1 in 80 to a second weighbridge, where the tare is obtained; and then down a further incline to the siding for empty waggons. Some of the tip sidings have double lines of way, which are intended for waggons from different pits; so that ships may be loaded with any desired proportion of two different sorts of coal.

Each shoot is fitted with an arrangement of screens, so that either unscreened, screened, or double-screened coal may be shipped; also with a hydraulic lifting and turning jib-crane, which serves to carry an anti-breakage box, and also a skip in which the screenings are collected and emptied into a truck on the quay below. When the first load is tipped into an empty vessel, especially if it lies low, so that the shoot has a steep inclination, it would strike with great impetus on the bottom; breaking the coal, and also incurring some risk of injury to the vessel. The too-rapid falling of the coal is prevented to some extent by sliding doors on the shoots; but especially by the anti-breakage box. This is a wrought-iron receptacle capable of containing about 4 tons of coal. It is suspended in position at the mouth of the shoot, filled with coal, and then lowered to the bottom of the hold. The bottom is hinged and held in place by a bolt; and this being withdrawn, leaves the contents at the bottom in a conical heap, which serves to receive and break the fall of the bulk of the cargo. The anti-breakage box is moved out of the way after having been used, until a mound of coal reaching nearly to the mouth of the shoot is formed. The shoot is 11 feet wide at the top end, but tapered towards the point, where there is a sliding door to regulate the supply of coal; and the sides are sufficiently high to enable it to receive the whole contents of a ten-ton truck at once. The inclination of the shoot can be altered—it can be raised or lowered; and it is also pivoted at the butt end so as to give it side play, and enable it to be adjusted to the hatchway. The whole working is controlled by an operator stationed in a cabin on one side of the frame, and so placed as to command a view of the deck of thevessel.

The low-level tips, or hoists, differ from the foregoing, inasmuch as the loaded waggons are received into the hoist at the level of the quay, and the empty ones are returned at the same low level. On account of the limited space, the lines of rail for supplying these approach at a sharp angle, which necessitates the use of turntables both on the full and the empty lines. The wrought-iron guide-frame for the hoist, which supports the coal-shoot, and also guides the cradle during its ascent and descent, is 57 feet high; and there is a clear lift of 37 feet effected by two vertical direct-acting rams, respectively 11¼ and 6⅛ inches in diameter. When lifting, both these are exposed to the full hydraulic pressure; but in lowering, the large one only is allowed to exhaust freely, while the small one returns water to the accumulator under the influence of the descending cradle and empty waggon. In addition to a crane and anti-breakage box similar to that already described, each of the low-level shoots is fitted with an anti-breakage device. As the coal leaves the waggon, its motion is arrested by a sliding door across the shoot. This door can be eased away down the shoot, until, when near the bottom, it opens a passage through which the coal can drop gently into the hold. This sliding door is moved up and down the shoot by means of a hydraulic cylinder on the side, which, like the rest of the machinery, is under the control of the man in the cabin.

It appears that a difficulty in connection with loading coal on a large scale in this manner is the "trimming." Frequently the machinery is stopped until the trimmers have completed their part of the work. To facilitate this operation, boards 2 ft. 4 in. in width, and either 6 or 12 feet long, covered with galvanized iron, are used as inclined planes in the hold. Some ships are called "self-trimmers;" and these have two large hatchways with feathered wings, which serve to spread the coal in the hold, and leave little more to be done in the way of "trimming" beyond levelling down.

Two moveable tips—one for the high, and the other for the low level—are in course of construction. These are intended for use in connection with one of the fixed tips. One of the hatchways of a coal-vessel being brought into position with the latter, the moveable tip is adjusted to the other. Thus both can be fed at the same time; and there is no need for a second adjustment of a vessel in order to supply the second hatchway. These moveable tips are made to travel about 50 feet on either side of the centre line, and are connected to the line of rails by a girder bridge, one end of which is pivoted to the tip, while the other moves on a pair of rails, curved in such a way that the tangent to the rails at the point where the rollers on the bridge rest is at right angles to the centre line of the bridge, in whatever position it may be. When the tip is moved in either direction away from the centre line, the bridge is drawn away from the approach, and also turns at an angle to it. The ends of the rails forming the line of way are made telescopic, to allow of small variations in the position of the bridge; and loose sections of rails provided for the purpose are inserted, to fill up greater variations. The tip is moved by a hydraulic engine geared to the travelling wheels.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Gas Companies and Electric Lighting.

SIR,—Last session several gas companies advertised notices of their intention to apply to Parliament for powers to supply the electric light along with gas as one undertaking, with a common purse, and an uniform dividend over the whole capital; so that, if the electric lighting proved a loss, it might be made up by any excess of profits there might happen to be on the gas lighting. But as this would have been (in principle) contrary to the practice of Parliament in such instances, the few cases that were proceeded with were all disallowed. I shall, therefore, feel obliged if you will permit me to say a word or two in the JOURNAL as to what that practice is in these cases.

All statutory powers granted to a commercial undertaking for the supply of any commodity or convenience to the public are more or less monopolies; and as all monopolies are obnoxious to modern legislation, Parliament always imposes upon such undertakings certain provisions for the protection of the public, so as to prevent, as far as practicable, any misuse of such powers, as, for instance: (1) A limit to the dividend on the capital expended; (2) A provision that, if the profits exceed that limit, the excess shall be applied to a reduction of the charges made to the public, so as to confine the profits to as nearly as may be the amount required to pay the limited dividend. All gas companies under statutory powers are subject to these regulations. The consumers therefore have as large an interest in the just appropriation of the excess of profits as the companies themselves, and perhaps more so, as it is the only provision on which they can rely for securing a reduction in the price of gas; and if this excess were applied to any other purpose, they would have no protection at all.

When capital has been authorized for any special purpose, it is contrary to law to apply that capital or any funds relating thereto to any other purpose; and Parliament will not permit it to be so applied, unless some very potent reason can be shown for doing so. Hence capital authorized for gas purposes cannot be applied to electric lighting. If a gas company undertook to supply electric light in conjunction with gas, and met with a loss on the electric light while it had an excess of profit on the gas, it could not apply that excess to making up the loss on the electric light, as the excess on the gas is already appropriated to the consumer, and Parliament will not allow it to be applied to any other purpose. If at any future time it should be found expedient to allow gas companies to supply the electric light, it will and must be by means of a separate undertaking distinct from the gas, with a capital subscribed for that purpose by another body of shareholders, and subject to all the customary regulations in such cases, as though it were a different company; and any excess of profit, whether on the gas or the electric light, will be applied (as in all other cases) to a reduction of the charges made by that undertaking, so that the shareholders in one undertaking shall not be benefited, nor the consumers prejudiced, by the profits or losses on the other. When there are two undertakings under one company, each undertaking must stand or fall by its own operations without assistance from the other. If either ceases to be profitable, it must be abandoned without reference to the other, and not be maintained in a false position by forced contributions from the other. No person can be a director of any undertaking unless he is a shareholder in that undertaking; and when the two undertakings are antagonistic to each other, like gas and electric lighting would be, each undertaking ought to be represented on the board. If gas and electric light were worked together as one undertaking in the manner proposed, it would be impossible to make any satisfactory provision for the regulation of the respective charges; and the consumers would be left entirely at the mercy of the companies. The profits on one might be lost on the other, and unnecessarily high charges be made for both. The injustice of such a proceeding is so manifest, that it is difficult to understand how any company could expect it would be allowed.

Last session a gas company, alarmed at the number of applications for electric lighting powers, and thinking they might strengthen their own position by taking power to supply it themselves along with gas as one undertaking, with one capital, a common purse, and an uniform dividend, applied to Parliament for the necessary powers. About one-third of their authorized capital had not at the time been issued, and Parliament allowed the company to raise that third as electric lighting capital for a separate undertaking, subject to all the customary regulations; and specially provided that the excess of profits on that undertaking, if any, should be applied to a reduction of charges made by that undertaking, and left the excess on the gas undertaking to remain as originally provided. How the shareholders of a gas company can possibly be benefited by such powers, your readers must decide for themselves.

WM. LIVESEY.

Gas Companies' Association, 76, Palace Chambers, Westminster, Sept. 5, 1890.

Mr. Gadd's Gas Institute Paper and Mr. Cripps's Criticism.

SIR,—Your anonymous correspondent "Gas Engineer," unfortunately shows himself to be either grievously lacking in good faith, or has written with an absence of that care which he professes.

He, very unfairly—considering the full correction already made—takes the error of figures in my paper as the basis of his attack. Argument with such tactics is utterly wasted. Considering his contempt for experiment (no wonder at it!), your readers might be more benefited by some understandable mechanical *proof*, in lieu of these mere assertions, the form of which bears such a family likeness to some others.

W. GADD.

Manchester, Sept. 10, 1890.

SIR,—As a son of Mr. Gadd, the inventor of the new method of gasholder construction, I not unnaturally take some interest in the controversies regarding him. By profession I am an analytical chemist, but may perhaps be pardoned for assuming a little mechanical knowledge.

I note in Mr. Cripps's criticism (on which I do not wish to comment)

the following, with regard to points of support on either side of a neutral axis: "Only one, at best, can be at the extreme distance, the others approaching much nearer the axis, and therefore *offering but little resistance*" (page 143); whereas, in contrast to this, I find on page 554 a letter from a "Gas Engineer," in which he says in the third paragraph, that the support "*farthest* from the neutral axis" is the one most "severely strained."

Without suggesting which of these statements is the right one, or whether it be possible for them to be reconciled, it may be well to call attention to the apparent contradiction.

Manchester, Sept. 13, 1890. W. LAWRENCE GADD, F.I.C., F.C.S.

Next Year's Examinations in Gas Manufacture.

SIR,—With reference to your remarks on p. 555 of last week's issue, upon next year's technological examinations, might I be allowed, as a former prize winner, to supplement the list of books recommended by the following, which, though not directly connected with the subject of "Gas Manufacture," would, I feel sure, prove of much assistance to intending candidates, especially those who wish to qualify for the full certificate in either grade: Rivington's "Notes on Building Construction," Parts I., II., and III.; Maxwell's "Heat," included in "Text Books of Science" Series; Geikie's "Class Book of Geology;" Neil Arnott's "Elements of Physics;" and Paterson's "Lithology of Coal." These are all works which, without going very deeply into any of the subjects with which they deal, impart a thoroughly sound knowledge to any student who reads them carefully.

I would also suggest that candidates keep pace with the current literature of the day, whether in the form of articles which may appear from time to time in the various journals devoted to gas manufacture, or as papers read at any of the meetings of The Gas Institute or kindred Societies or Associations throughout the kingdom. This latter description of literature connected with our profession frequently contains the very cream of the latest improvements and investigations, which very few of even recent books can give. I would also caution candidates against spending too much time over "King's Treatise," which, though an excellent work and likely to long continue as a standard authority, is too voluminous for convenient study; being in fact a treatise and not a text-book.

Lastly, I would recommend students to make themselves acquainted with apparatus or processes in use at works other than those wherein they may happen to be employed—either by personally visiting any special works in question, or, if this is not possible, by applying to the manufacturer of any special apparatus, who will be only too pleased to forward an illustrated catalogue. Or, should either of these means fail, the student can sometimes refer, as a last resource, to the Patent Office records, where much valuable information can be obtained.

In conclusion, all students, both young or old, should early begin the formation of a technological library. This is not a difficult nor an expensive matter, as the works relating to subjects connected with gas manufacture are few in number, though high in price compared to many text-books. Of course, one is well aware that the reading of clever books does not, as a necessary consequence, produce clever men. At the same time, it must not be forgotten that, if illumination by coal gas is to be in the future what it has been in the past, each member of any gas undertaking, public or private, municipal or otherwise, must combine a sound practical with a sounder theoretical knowledge of his business. Again, the happy possessor of certain books may occasionally be able to lay his hand upon certain information or certain facts of vast and immediate importance to the work he has in hand at the time, whilst his neighbour, wanting such aids or assistance, is moving heaven and earth to attain the same end. Therefore, on the appearance of any work connected with gas manufacture or kindred subjects, I say to all young men: Procure a copy, study it earnestly, and lay it aside, knowing well that, if it be not of immediate use, the chances are greatly in favour of your requiring its assistance before your time for work has passed.

Sept. 14, 1890. C. I. M. A.

The "Penny-in-the Slot" Gas-Meters.

SIR,—In your paper of yesterday's date, you refer to the adoption of these meters in Bolton. They are manufactured by Messrs. Sawer and Purves, of Manchester; but the patent is the property of Thorp and Marsh, and not as stated. I may remark that these meters are also in work at Birmingham, Blackburn, and a number of other towns. The amount of gas supplied for a penny can be regulated according to the price charged for the gas.

As your paragraph is likely to cause mistake, will you kindly make this correction in your next issue?

Lytham, Sept. 10, 1890. THOS. G. MARSH.

[Messrs. Sawer and Purves, of the Garratt Street Works, Manchester, also write to point out that they are the sole makers of the meter referred to in the paragraph of last week. They remark that the mechanism of the meter is simple and self-contained, and can be added to any existing meter without difficulty. To obtain gas, all that is necessary is to raise a lever, drop a penny into a slot, and push the lever home. This action opens an admission valve to the required extent, and at the same time frees the drum. It is a chief feature of the apparatus that no gas can pass without being registered; nor can the valve be opened except by the prepayment of the necessary coin. The coin drops into a drawer, which can be locked and sealed so that it cannot be opened without detection. Thus there are two checks upon fraud—the registration of the quantity of gas used, and the value of the coins in the box. An additional pennyworth of gas can be obtained without waiting until the one being used is fully consumed; but the whole quantity of gas paid for will be delivered. The action is entirely automatic; and the movement can be applied to either wet or dry meters. Messrs. W. and B. Cowan write from Edinburgh to correct the impression that might be conveyed by the paragraph, that the automatic penny meters they supply at Bolton and elsewhere are manutactured by another firm. They ask us to state that all the meters they sell are manufactured on their own premises by themselves.—ED. J. G. L.]

MISCELLANEOUS NEWS.

CONTINENTAL UNION GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 7, Drapers Gardens, E.C.—Mr. H. M'LAUCHLAN BACKLER in the chair—to pass the following resolution: "That the capital of the Company be reduced from £1,000,000 to £927,196 by reducing the 12,134 new shares of £20 each (with £14 paid thereon) to 12,134 shares of £14 each."

The SECRETARY (Mr. F. W. Himing) having read the notice convening the meeting,

The CHAIRMAN said that the meeting was merely a formal one, to carry out that which was unanimously accepted by the shareholders when they met together on the 27th ult. He was exceedingly sorry they should be put to the trouble of coming there several times to carry out a matter which men of business would have settled in a quarter of an hour without any difficulty whatever. However, they were obliged to conform with the joint-stock laws as they were interpreted by judicial decisions. These decisions were constantly altering the state of the law; and the Company were obliged to amend their regulations and mode of procedure accordingly. It would be necessary to hold another meeting on the 24th inst., when the resolution he was then proposing for adoption would be brought forward for confirmation. A third meeting would be held as soon as the sanction of the Court had been obtained to the reduction of capital; and the object of that would be to effect the conversion of the shares into stock. Then he hoped the Directors would be able to pay the next dividend on the stock, instead of the shares; and the shareholders would realize all the advantage of the conversion.

Mr. H. SOLOMON seconded the motion, which was at once unanimously adopted; and this concluded the proceedings.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. FREDERIC LANE LINGING in the chair.

The SECRETARY (Mr. Magnus Ohren) read the notice convening the meeting; and it was agreed to take as read the report of the Directors and the accounts for the half year ending June 30 (*ante*, p.457.)

The CHAIRMAN, in moving—"That the report of the Directors and the balance-sheet, examined and signed by the Auditors, be received, adopted, and entered upon the minutes," observed that the statement of accounts which had been circulated among the shareholders was not quite so flourishing as the Directors were accustomed to submit; but this entirely arose from circumstances over which the Board had scarcely the least control. Labour, coals, and other materials used in the manufacture of gas had risen in price to a large extent; and he thought they might consider they were going through a period somewhat similar to that of 1872-3—usually called the period of the coal famine—when coals were more costly than they were now. Yet the Company passed through that time without any serious damage to their finances; and, therefore, they must hope that, when the inflated price of coal subsided, they would be equally fortunate. That coal would recede to the low price which ruled for some years, was a matter upon which he would not offer any opinion; but he did know this—that, in the coal famine of 1872-3, people who professed to know said that coal would never be cheap again, and yet the cloud of depression rolled over the country, and coal was really cheaper than it had been for some years. With regard to the last reduction the Directors made in the price of gas, he fancied that, had they been permitted to look into the seeds of time, and see which seed would grow, and which would not, they might have paused before taking that step. When, however, the reduction was made, the Company were very prosperous. They could not add to their reserves; and they were carrying forward a very large balance from half year to half year. Therefore, the Board thought that, to carry out the rule they laid down for themselves many years ago, the consumers were fully entitled to the concession in price, and in good faith they made it. With reference to the half-year's working, the returns from residuals exhibited a marked improvement; and the quantity of gas sent out was also satisfactory—the increase being 2·41 per cent. compared with the corresponding half of last year, which period only had an increase of 1·61 per cent. in comparison with the June half of 1888. He believed this was evidence which would convince the shareholders that the Company were progressing, and that their business was a substantial one. It might be said—and indeed he had been asked the question by more than one influential shareholder—"Why, in the face of all this extra expense that you cannot control, do you not at once raise the price of gas?" His reply was that the Legislature in granting gas companies certain concessions—amongst them their reserves—contemplated that those reserves should be used for specific purposes. Therefore the Directors thought that, to attempt to increase the price of gas at the present time, would be premature, and certainly not conducive to the interests of the shareholders. At the expiration of the current half year, they would be better able than now to judge what their financial position was; and the proprietors might rest assured that the Directors would not forget their interests, and, whenever it was found advisable to increase the price of gas, they would not hesitate to do it. To this he believed the consumers would not offer the least objection or complaint, because they knew that the Board had never upon any occasion hesitated for one moment when they considered they could lower the charge for gas. It would be seen from the accounts that the balance of profit was £7430. This, of course, would be augmented by the interest on the reserves (£942); giving a sum of £8372 with which to meet the dividends. Adding this to the balance brought forward on December 31 last, they were enabled to easily pay the dividends upon the respective capitals, and to carry over upwards of £8700 to the present half-year's accounts.

There were one or two items in the accounts he should mention because it would satisfy the shareholders as to the difficulties the Directors had had to battle with during the past six months. Referring first to the outlay under the head of manufacture, the cost of coal had increased by £3732 in comparison with the corresponding period of 1889. Purification expenses were £198 more. Wages and gratuities had absorbed an additional £2398; and the item for the maintenance of works, machines, retorts, &c., had risen by £2012. Here were extra expenses amounting to upwards of £8000 which the Board had had to contend with; and therefore this indicated that, had the Company been in the position they were in twelve months ago, they would have been singularly prosperous, and they would have had a large sum to carry forward as a floating balance. The other items on that side of the revenue account did not call for any special remark; but on the credit side, under the head of gas-rental, there was in consequence of the reduction in price already alluded to, a decrease of £1327. The residuals had shown, as previously observed, a marked improvement; being £2037 in excess of the corresponding period. Coke, it was hoped, would give even a better return during the current six months. With regard to the manufacturing operations, 40,186 tons of coal had been carbonized, as against 38,080 tons, or an increase of 2106 tons. The cost of coal was 14s. 8d., as against 13s. 7d. The quantity of gas sold was 368,514,000 cubic feet, compared with 360,181,000 feet; being an increase of 8,400,000 feet. In other respects they were going on exceedingly well. The unaccounted-for gas was about 5 per cent.; and the capital per ton of coal carbonized was only £4 10s. 8d. All this to his mind was convincing proof that, notwithstanding the many troubles they had had to face, the concern was in a satisfactory position. Allusion was made in the report to the loss of Mr. Henry Palfrey Stephenson, who was Deputy-Chairman of the Company at the time of his death. It would be in the remembrance of the shareholders that at the autumn meeting in 1888, he (the Chairman) referred to the long career of Mr. Stephenson, in connection with the Company, and to his devotion to its interests; and he need not therefore repeat what he then said, except to observe how much he personally regretted his loss as a colleague and a friend. *Sic transit gloria mundi.* Mr. Alfred T. Layton, who had been for many years an Auditor of the Company, had resigned his position, on being selected to take a seat at the Board. There was thus a vacancy in the auditorship; and there were originally four candidates for the office. They were Mr. Albert Helps, Mr. R. Hesketh Jones, Mr. Alfred Lass, and Mr. William Westcott. Both Mr. Helps and Mr. Jones had withdrawn their names; and therefore the election remained between Mr. Lass and Mr. Westcott.

Mr. J. GLAISHER, F.R.S., seconded the motion.

Mr. BESLEY, having congratulated the shareholders upon the position of the Company, called attention to the amount of gas unaccounted for, which he considered, having regard to other gas companies, was rather beyond the usual percentage. It appeared that there was nearly 20 million cubic feet of gas unaccounted for; but probably there was an easy explanation of this. With regard to the reserve fund, he thought it rather an antiquated idea to have it invested in Consols; and, in his opinion, there would be no impropriety in putting the money into inscribed colonial stocks. For instance, there was New South Wales 3½ per cent. inscribed stock, which would afford a larger return, though perhaps not more than £200 or £300. It also appeared that the Consols were bought at a premium. It seemed a sad state of things that with only 2¾ per cent. at the present time, and a prospect of diminishing to 2¼ per cent., there should be purchases made of Goschens at above par price

The CHAIRMAN, in reply, said that really the leakage was rather low. The Company's district was only about half occupied with houses—their pipes ran through many blank roads and fields; and, therefore, a loss of 5 per cent. of gas was not considered by gas engineers to be exorbitant. From Field's "Analysis," he found that the average amount of the unaccounted-for gas of the three Metropolitan Gas Companies was 5·34 per cent.; so that they were in a decidedly good position in this regard. With reference to the question of securities, he did not know whether Consols were antiquated; but he did know that they were very secure. They had held the Consols for a number of years; and the Directors thought it advisable to continue to do so. However, he received Mr. Besley's suggestions with every respect; and they should have due consideration.

The motion was then carried.

On the proposition of the CHAIRMAN, seconded by Dr. F. HETLEY, dividends were next declared at the following rates per annum: 6 per cent. on the preference stock, 7 per cent. on the ordinary 7 per cent. stock, 10 per cent. on the ordinary 10 per cent. stock, and 7 per cent. on the new ordinary 7 per cent. shares, all less income-tax.

The next business on the *agenda* was the election of an Auditor in place of Mr. Layton; and the Chairman suggested that the names should be taken in alphabetical order.

Mr. ROBERT KING proposed that Mr. Lass be appointed to the vacancy. That gentleman, he said, was a Chartered Accountant, and thoroughly acquainted with all the details connected with gas companies. He was Secretary of the Barnet District Gas and Water Company and of the Georgetown Gas Company, and was besides the author of an annual digest and analysis of the accounts of the London Water Companies. Recognizing all these qualifications, he had great confidence in placing Mr. Lass's name before the shareholders for acceptance.

Mr. ALFRED WILLIAMS seconded the motion, and expressed his concurrence in the remarks made by Mr. King.

Mr. BODDY moved the appointment of Mr. Westcott, who, he said, was a man of large experience as an accountant. He formerly held the post of Auditor to the Surrey Consumers' Gas Company, of which he (the speaker) was Secretary. He had, therefore, had ample opportunity of observing his capabilities; and the attention he bestowed to the duties of his office gave satisfaction to all concerned.

Mr. A. PARNACOTT seconded the motion, and Mr. BESLEY supported it.

The votes of the shareholders having been taken, the CHAIRMAN declared that Mr. Lass had been elected.

Mr. LASS assured the shareholders that he was exceedingly obliged to them for electing him an Auditor of the Company—a post which he considered was one of great honour; and he promised to endeavour to perform the duties that would devolve upon him in a careful and efficient manner.

On the proposition of Mr. WILLIAMS, seconded by Mr. HOUNSHAM, a vote of thanks was passed to the Directors for their services during the half year.

The CHAIRMAN, having acknowledged the compliment, proceeded to propose a vote of thanks to the Auditors.

Mr. WESTCOTT seconded the proposition, which was unanimously agreed to.

Mr. C. NEWTON briefly responded on behalf of himself and his former colleague.

The services of the officers were also recognized, on the motion of the CHAIRMAN, seconded by Mr. BESLEY.

The SECRETARY (Mr. Magnus Ohren), in reply, said he could say that the whole of the staff had performed their duties to the best of their ability, and had given their attention to every point that could enhance the interests of the concern.

The ENGINEER (Mr. Charles Gandon) thought it was always an agreeable thing to hear the shareholders of a Company pass a vote of thanks to their officers; and it was especially gratifying to them on the present occasion, as, unfortunately, they had not been able to make things appear so successful as they had been generally. He could assure the shareholders, on his own part, that this had been caused by no negligence or indifference. The past twelve or eighteen months had been a very anxious time for everyone connected with gas companies. The labour agitations had troubled them; and they had led to a large increase in the cost of coal. But their Company did not stand alone in this respect. He had analyzed the working of other companies in a similar position to themselves; and, although such favourable results were not shown as in the past, they were not behind what other companies had done. He added that the relations between their Company and the men were at the present time of the most amicable kind; and he was very sanguine that, both as regarded labour and the cost of materials, they would witness a very marked improvement during the next twelve months.

The proceedings then terminated.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Directors of this Company will report at the meeting of the shareholders on the 18th prox. that, during the half year ending June last, there has been a satisfactory increase in the sale of gas; and the accounts show that the full dividends allowed by the Company's Acts can be paid without recourse being had to the reserve fund, which stands at £78,618. These dividends the Board recommend shall be paid; and they will, in all, amount to £33,251. Referring to the Provisional Order which was granted to the Company during the past session, the Directors state that by it, they may store gas and residual products on some of the Company's lands at Neepsend, which they were previously prohibited from using for these purposes; the ordinary half-yearly meetings of the Company, instead of being held in April and October, may, after the first of January next, be held in February or March, and in August or September; and the limit of the remuneration which the shareholders can vote to the elected Directors, for their services, has been increased, and is now £2000 per annum. The increased storeage for gas now being effected at the Neepsend works will, unless something unforeseen should happen, be available during the forthcoming winter. Turning to the accounts, it is seen that the receipts during the half year amounted to £130,179, which was made up of the following items: Sale of gas, £83,360; meter and stove rental, £4706; residual products, £40,652; and sundries, £1460. The amount expended in the manufacture of gas was £78,247; in the distribution, £5631; and in rents, rates, and taxes, £6250. The management expenses came to £4177; the law charges, to £200; and the bad debts to £194. Deducting the expenditure from the receipts, there remains as profit £35,478, which, with the balance from last half-year's accounts, makes the amount available for dividend, £48,902. Of this the dividends recommended will absorb, as already stated, £33,251; and there will be a balance of £15,651 to carry to the current six months' accounts.

Maryborough (Queensland) Gas Company.—At the half-yearly meeting of this Company on the 1st ult., the Directors submitted accounts showing a balance of profit available for distribution of £1463. A dividend at the rate of 10 per cent. per annum absorbed £1250 of this sum; and the remainder was devoted to the renewal and reserve fund.

Falmouth Gas Company.—At the recent annual meeting of this Company, the report submitted by the Chairman (Mr. R. M. Tweedy) stated that, under the Act of Parliament which received the Royal Assent in July last, the Limited Company had been dissolved, and the assets handed over to the incorporated Company. The works, plant, &c., had been valued by Mr. Corbet Woodall at £16,281; and as the increase in value had been largely made from revenue, it was thought that the shareholders were entitled to receive an immediate benefit of a portion of the difference at which the property stood in the books of the Company and the amount of valuation. The Directors, therefore, inserted a clause in the Act increasing the paid-up capital to £13,500; the increase of £1500 to be distributed amongst the shareholders as a capital bonus of 12½ per cent. on their previous holdings, on which increased amount they would in future receive their dividends. Speaking of the working of the half year, the Board stated that, owing to the large increase in the cost of coal, they had been obliged to raise the price of gas at Christmas last from 3s. 9d. to 4s. 2d. per 1000 cubic feet. They also recorded the loss of their colleague, Mr. W. H. Thomas, who for many years took an active interest in the affairs of the Company. An interim dividend of 5 per cent. was paid in February last, and the Directors recommended a further payment of the same amount; making 10 per cent. for the year, with a bonus of 9d. per share. The report was unanimously adopted; and the suggested dividend declared.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

Annual Report and Accounts.

At last Tuesday's Meeting of the Carlisle Town Council—the MAYOR (Mr. R. Foster) presiding—the report and accounts of the Gas, Water, and Baths Committee for the year ending June last were presented.

The portion of the report dealing with the Gas Department stated that the accounts again showed an increase in the consumption of gas; and a decrease in the revenue, caused by the recent reduction in price. The revenue had also been materially affected by the advance in the rate of wages, and a still larger rise in the cost of coal. Every effort had been made to reduce the cost of production in other ways; but notwithstanding the success which had followed these efforts, and the improved returns from residual products, the profits for the year were, from the causes referred to, somewhat less than in the previous year. The Committee, however, did not feel it necessary to recommend an advance in the price of gas at present; and they trusted that it would not be requisite in the future. It was also stated that extensive additions were now being made in the purifying plant and apparatus, which it was anticipated would increase the efficiency and economy of production. During the year extensions of the engines and exhausters had been completed, and had proved highly satisfactory. With reference to the Water Department, it was stated that the accounts likewise exhibited an increase in the quantity of water sold; and a decrease in the revenue therefrom—the result of a reduction in the charges, as in the case of gas. The gross profits for the year were as follows: From gas, £6307; from water, £4524—together £10,831. The Engineer (Mr. J. Hepworth, M. Inst. C.E.) reported that the quantity of coal and cannel carbonized during the year was 18,750 tons; being an increase of 1466 tons. The amount of gas made was 198,907,000 cubic feet; or an increase of 5,756,000 feet. The production of gas per ton of coal was 10,607 cubic feet—a decrease of 567 feet. The quantity of gas accounted for was 193,136,315 cubic feet; being an increase of 7,474,315 feet. In 1889 the percentage of gas unaccounted for was 3·87; and for the past year it was as low as 2·90. The average illuminating power of the gas was 19·49 candles. With regard to the Water Department, Mr. Hepworth reported that the quantity of water pumped in the course of the year was 332,602,237 gallons; being an increase of 13,364,789 gallons. The average daily supply per head of the population for all purposes was 21·69 gallons. With regard to the accounts, the total receipts for the year in the Gas Department were £28,805; and the expenditure came to £22,498—leaving as profit the before-mentioned £6307. The income of the Water Department amounted to £6964; and the disbursements, to £2439—giving as profit the sum of £4524.

The minutes of the Committee (which were confirmed) contained the following recommendations: "That the sum of £3507, being the balance of the profits from the gas-works for the past year, amounting, together with the sums previously paid, to £6007, be paid to the credit of the city fund. That the sum of £4452, being the balance of profits from the water-works for the past year, be paid to the credit of the district fund."

The MAYOR, in moving the adoption of the report and statement of accounts, congratulated the Council on the fact that in spite of th increased price of raw materials, a profit of £6307 had been made by the gas-works and £4524 by the water-works; making a total profit of more than £10,000 from the two undertakings. The question had been raised whether the price of gas should be increased. Some towns had had an advance of 3d. or 4d. per 1000 cubic feet; but the Committee considered they would rather not increase the charge. They thought it would scarcely be fair to tax the large consumers of gas for the purpose of handing money over to the next generation. Their works were in excellent order; and he thought it was hardly necessary to add anything to the report of the Manager.

Mr. CREIGHTON, in seconding the motion, agreed with the Mayor that the Gas Committee and their Manager had done extremely well by the public during the past year. He pointed out that the Gas Committee had done away to a large extent with Sunday labour; and this he thought was a move in the right direction. He congratulated the citizens of Carlisle upon the management of the works, and on the amount of ability and attention Mr. Hepworth brought to bear on them; and said he might mention that it was a proof of the high esteem in which Mr. Hepworth was held by his colleagues in the gas world that he had been elected President of The Gas Institute. He could only say that he hoped the Mayor and the Chairman and members of the Gas Committee next year would assist Mr. Hepworth in upholding the dignity of the old city, and in extending a hearty welcome to the Institute.

Mr. STORY criticized the accounts, and complained that, whereas in private concerns, economy would be exercised in bad times, in the case of the gas-works with falling profits there had been more extravagance. He considered that some effort might be made to increase the revenue. There were 800 houses in Carlisle in which not one penny-worth of gas was consumed; and if they could get these houses to burn gas, the revenue would possibly be increased to the extent of £1000. There was a system being adopted in Bolton and Birmingham with a view to obtaining the custom of the poor. It was called the "slot system," and by it five hours' consumption of gas could be obtained for a penny. If they adopted this system at Carlisle, and induced the 800 householders to consume sixpennyworth of gas a week, they would obtain an additional £1000 a year.

Mr. BLAIN said that the Gas Committee had already authorized Mr. Hepworth to buy one of the "slot" meters to which Mr. Story had referred, and have it placed in position, so that the Committee might examine it.

Mr. CREIGHTON said that Mr. Story had omitted to take into consideration the reduction in the price of gas, which involved about £2000. As to the increase in the amount expended on repairs, they were not allowed now to have a depreciation fund, and repairs must be met out of the annual revenue. It was impossible, therefore, to equalize the sum spent upon repairs, as the expenditure depended upon what streets were being remade and what new mains had to be put in. As Mr. Blain had pointed out, the Committee endeavoured to keep abreast of the times; but they also tried to avoid bogus schemes. Some members had at one time suggested the introduction of water gas; but if they had followed that advice, the town would not have been richer to-day.

Mr. STORY remarked that although a reduction of gas by 3d. per 1000 feet meant a decrease of more than £2000 in receipts, the actual decrease had only been £1448. This showed the elasticity of their business.

The motion was then agreed to.

THE RAWMARSH LOCAL BOARD'S NEW GAS-WORKS.

The new gas-works of the Rawmarsh Local Board are approaching completion; and the description we have received of them shows that they will be of a most complete and modern character. In the year 1879 the Board obtained a Special Act of Parliament authorizing them to purchase from the Corporation of Rotherham the gas mains and pipes within the Board's district, and also, after the expiration of nine years from the vesting in them of the mains and pipes, to construct works for the manufacture of gas. Thus it will be seen that the works have not been hurriedly decided upon. The site of the new undertaking is a convenient one. It is bounded on one side by the Midland Railway. The complete works will be capable of producing from 25 to 30 million cubic feet of gas per annum; the present consumption in the district being about 20 million cubic feet. The retort-house is 77 feet long by 28 feet wide, inside measurement, built of bricks, with stone dressings, and iron roof. It contains a retort-stack, with five benches, with six single clay retorts in each, supplied by the Farnley Iron Company, of Leeds, and erected by Messrs. Drake and Son, of Halifax. An ample coal-store bounds one end of the retort-house, and is so placed that a siding from the adjacent railway can be run through it for depositing the coal therein from a higher level. The purifying-house is 46 feet square, and contains four purifiers. An engine, exhauster, and boiler house is built abutting on to the retort-house; and the structure is covered by a cast-iron cistern, divided into three compartments for clean water, ammoniacal liquor, and tar. On the left of the entrance to the works is the weigh-office, with a waggon weighbridge in front, made by Hodgson and Stead, of Manchester; and to the right is the station meter and governor house, containing the requisite apparatus, supplied by Messrs. Guest and Chrimes, of Rotherham. The sulphate of ammonia house is under the same roof with the coal-store, and is advantageously situated. The condenser is an annular one, consisting of three columns, each 16 feet long. The tar well is placed underground and is circular in shape, 20 feet diameter and 10 feet deep. The steam-engine and exhauster were made by Messrs. G. Waller and Co.; the latter being capable of passing 10,000 cubic feet of gas per hour. A battery of three pumps for water, liquor, and tar is arranged outside the exhauster-house. A tower scrubber, 30 feet high and 5 feet diameter, have been supplied by Messrs. R. Dempster and Son, Limited, of Elland. A washer-scrubber, of Kirkham's make, comes next; and this is actuated by a small steam-engine. The gasholder tank is 82 feet in diameter, and 20 feet deep; while the gasholder is 80 feet in diameter and 20 feet deep on the sides, with a rise of 4 feet in the crown, which is trussed with wrought-iron framing. The standards are ten in number of wrought iron, with lattice girders and wind ties. The contractors for the holder and ironwork generally throughout the works were Messrs. R. and J. Dempster, of Manchester. At the inspection of the works by the members of the Board a fortnight ago, a resolution was passed expressing their sstisfaction with the work, and the manner in which it had been carried out. The total cost, including the purchase of the site, is about £10,000. The Engineer is Mr. T. Newbigging, C.E., of Manchester. It is understood that the Board will begin the manufacture of gas about the end of October—on the termination of the contract with the Rotherham Corporation.

THE ACCRINGTON CORPORATION AND THE GAS AND WATER WORKS.

Meter-Rents—Suggested Purchase of the Undertakings.

At the last Meeting of the Accrington Town Council—the Mayor (Mr. Alderman Hindle) presiding—Mr. Dewhurst proposed: "That a requisition be sent from this Council to the Directors of the Accrington Gas and Water Works Company, asking them to make such further reductions in their charges for the use of the gas-meters as will reduce such charges to a nominal sum." He remarked that it was only a short time since the Directors made certain reductions in these charges: but he thought they might have gone a little further, and followed the example of a few other towns in reducing the charges to a nominal sum or abolishing them altogether. Mr. Sprake seconded the resolution. Alderman Haywood said he was not at all surprised that this question should come up at this particular season of the year. It was brought forward not in the interests of the ratepayers, but for a purpose which Mr. Dewhurst perfectly well knew. If Mr. Dewhurst had only waited a little longer, he had not the slightest doubt there would have been further reductions; but the best course to follow with the Gas Company was not to provoke them by all the proceedings that were taking place. After further discussion, the motion was carried almost unanimously. Mr. Sprake then proposed the resolution of which he had given notice—"That the Legal and Parliamentary Committee consider the question of the Corporation acquiring the water supply at present in the hands of the Accrington Gas and Water Company; and for that purpose the said Committee be empowered to call in such practical and scientific assistance as may be deemed advisable in order to ascertain whether the supply of the borough of Accrington can be severed from that of the adjoining townships, and such other information as may be necessary, and report the result of their inquiries to the Council." Mr. Sprake said this was a matter which had been forced upon them by the report of the Medical Officer of Health, and the discussion they had had with reference to the

condition of the water supplied from the Burnley Road reservoir. The interest of the Company was a divided one in this sense—while they were supplying the people with water, they were also looking forward to having a dividend for themselves; but if the Corporation had the control of the water, their sole object would be to keep it pure. Mr. Withers seconded the motion; and, at his request, Mr. Sprake consented to include therein an instruction that the Committee should also inquire into the feasibility of purchasing the gas undertaking. The proposition gave rise to a long discussion, in which the old arguments for and against the purchase of the water-works were repeated. Very little opposition was offered to the inquiry proposed by Mr. Sprake, though several members took objection to the Corporation incurring any considerable expenditure in the matter by calling in scientific assistance, as a previous investigation into the position of the Company had convinced them that it would not be expedient to acquire the undertaking. It was understood, however, that the Legal and Parliamentary Committee would not go to any great expense without the authority of the Council; and the motion was carried with only two dissentients.

THE USE OF WATER GAS AT HARROGATE.

The Local Gas Company and the Council.

At the Monthly Meeting of the Harrogate Town Council held on the 8th inst., it was reported by the Town Clerk that Mr. Samson Fox would be the defendant in the action brought by Mr. Fawkes, of Farnley Dairies, to restrain the manufacturing of water gas in the Montpellier Gardens. A letter was afterwards read from the Secretary of the Harrogate Gas Company stating that their attention had been called to the workmen belonging to the Corporation breaking up the causeway in Ripon Road for the purpose of inserting pipes intended to convey water gas to the Spa Rooms. The communication went on to state that this was a breach of agreement between the Company and the Corporation. The Company desired to know if the footpath was broken up by the consent of the Corporation; as, if not, it was presumed the offenders would be prosecuted under the Public Health Act. Mr. Laycock said it showed there was a desire on the part of the inhabitants of the neighbourhood to have water gas. The Gas Company saw that the water gas was a success; and it seemed as if they regretted having granted permission to light Parliament Street with the new light. A memorial was then read upon the question from certain residents in James Street, asking for that street to be lit with water gas. Alderman Taylor said the memorial was complimentary to the Mayor (Mr. Samson Fox); but he did not think they could go into the matter at that time. Mr. Kendrew contended that they had as much power to allow the Water Gas Company to put mains in as they had the Water-Works Company. The Deputy-Mayor (who presided, in the absence in America of Mr. Samson Fox) said it was hardly worth while to break up another street seeing they had only seven weeks to run; but the lighting of the town could be tendered for in July subject to Counsel's opinion.

Harrow District Gas Company.—The accounts of this Company for the past half year have been issued; and the figures contained therein are almost identical with those for the corresponding half of last year. The sale of gas produced £3449; and the residuals realized £646. The total receipts were £4096, as against £4037 in the June half of last year; and the expenditure amounted to £2545, as compared with £2506. With the balance from the previous six months, the amount available for dividend is £1738, out of which the Directors recommend the declaration of a dividend at the rate of 7½ per cent. per annum on the original "A" capital of 7 per cent. on the first additional "B" capital, and of 5¼ per cent. on the second additional "C" capital, all less income-tax.

Sinking of a Well at the Croydon Gas-Works.—About twenty years ago a well was sunk at the Croydon Gas-Works to a depth of 246 feet; and though the chalk was reached at 108 feet, no supply of water was met with. The well was consequently abandoned and filled up. Recently Mr. J. W. Helps, the Engineer of the Company, consulted Messrs. Legrand and Sutcliff; and this firm selected a site some 300 yards distant from the old well in the direction of the outcrop of the chalk, where they have just put down one of their artesian bored tube-wells. The chalk was struck at only 74 feet from the surface; but the boring was carried to a total depth of 284 feet. An ample supply of water at once rose to within 6 feet of the surface; and this has enabled the Company to dispense with town water altogether, and so effect a considerable economy. A set of three-throw pumps, worked by a gas-engine, has been connected to the tube-well; and they deliver the supply into a tank, from which it is distributed over the works.

Northern Coal Trade.—There has been more ease in the northern coal trade during the past few days; and in some instances coal has been sold at rather lower prices, but these are exceptional. For best steam coal the price still asked is 13s. per ton free on board; but it is said that 12s. 9d. has been accepted to enable a colliery to keep fully at work. Second-class coal is duller; and small steam coal is about 6s. 6d. per ton. Bunker coal for steamships is very dull at from 9s. 6d. to 11s. per ton, according to quality. In gas coal, a large number of local contracts have been and are in course of negotiation; and where they have been settled, it is at an advance on the prices of the contracts they replace. One of the largest is now in the market—that for the Newcastle Gas Company; and it seems to be the belief that the price which will have to be paid will be from 10s. 6d. to 11s. per ton at the works. Probably, however, a week or so more will elapse before the decision. Manufacturing coals are in good demand; but the fine weather has made household coals very dull in price. There is no alteration of moment in the coke trade; but rather less has of late been exported, and the local consumption is looked to to make up the deficiency in demand. Gas coke is unaltered in price; but the production is rather larger than it was, and some of the inland towns seem to be accumulating a little stock.

THE BRADFORD CORPORATION GAS AND ELECTRICITY DEPARTMENT.

Half-Yearly Financial Statement—The Loss on the Electric Lighting Works.

At the Meeting of the Bradford Town Council last Tuesday—the Deputy-Mayor (Alderman Moulson) presiding,

Alderman F. Priestman proposed the adoption of the minutes of the Gas and Electricity Supply Committee, which included a resolution accepting the tender of Messrs. Siemens Bros., Limited, for the supply of machinery and cables required in the extension of the electricity works, for £450. Alderman Priestman proceeded to observe that he had before him the revenue account and balance-sheet for the half year ending the 30th of June last. He thought that, in view of the large increase in the price of coal, and also the rise which had taken place in wages, the statement would be of interest to members of the Council, as well as to the general public. The sales of gas during the half year amounted to £63,803; showing an increase of £2200 on the corresponding period of last year. The receipts for coke had been £11,950; being an increase of £4234. Tar, which produced £5914, exhibited an increase of £1176. The amount received for chemicals, £12,302, exceeded that of the previous year by £700. Meters had realized £1950; the increase being £254. Most of the other items, with the exception of bank interest, for which £150 more had been obtained, were about stationary. The totals of the respective half years were £97,324 for 1890 and £88,761 for the previous year. Turning to the other side of the revenue account, he found that coal cost £39,774; being an advance of £7400. The amounts expended in purification and on engineers' salaries remained very much as they were. The wages of the men (amounting altogether to £23,115) had augmented by not less than £4027. Repairs to mains and service-pipes in the six months had cost £2212, or £400 more than before. There was an increase in cartage and yard labour of £550; and for once there was a decrease in the amount expended on the erection and maintenance of public lamps. The sum spent in this way during the half year was £3511; being a decrease of £226. The expenditure on the chemical works had decreased by about £150. Bad debts absorbed £108 more this half year. All the other items on that side of the account had been practically the same. The interest on loans had been £9627; and the sinking fund, £4171. The balance of net profit was £6006, as against £10,800. This was, of course, in addition to the cost of the lighting and maintenance of the public lamps, which, as he had often remarked, amounted to at least £15,000 a year. Taking the capital account generally, he found there had been paid through the sinking fund loans, an amount of £91,147. The sum standing on the other side of the capital account was £578,113; leaving of what had already been borrowed an unexpended balance of £23,867. There was in the bank a balance of unappropriated profits; but of this he believed £15,000 had been appropriated by the Finance Committee. The balances, at the credit of the various accounts were: Appropriation account, £48,849; sinking fund, £8336; restoration fund, £25,000; interest on loans, £4979; and premiums for the issue of debenture stock, £1701. These, with the addition of the amount unexpended (£23,867), left a sum of £112,734 for carrying on the business. He had a few particulars in regard to the manufacturing operations. The tar produced during the half year had been 4986 tons—an increase of 555 tons. The average price realized had been 27s. 4d., as against 21s. 3d. The sulphate of ammonia produced was 1196 tons, as compared with 1060 tons. The prices obtained for sulphate had been £11 7s. 10½d. per ton, instead of £11 16s. The fall was mainly in consequence of the immense supplies of nitrate coming to this country from Chili and other parts of South America. The sulphate realized slightly over 2s. 5½d. per ton of coal, instead of 2s. 4¼d. The total amount of coal and cannel carbonized was 69,272 tons, or an increase of 3779 tons. The average cost of the coal was 10s. 5d., as against 8s. 6d.—an increase of 1s. 11d. per ton. The cannel cost per ton an average price of 15s. 0¼d.; being an increase of 11d. During the half year 699,673,000 cubic feet of gas had been made; being 35,129,000 feet in excess of the previous half-year's production. Of coke 31,061 tons had been sold—an increase of 5116 tons. The average price had been 7s. 8d. per ton, as compared with 5s. 11d. realized in the corresponding period of 1889; showing an increase of 1s. 9d. per ton. He thought the statement would be looked upon as a satisfactory one on the whole; and he trusted the time had not yet come when the Council would see any need to raise the price of gas.

Mr. D. Barker seconded the proposition.

Mr. Walker asked why Alderman Priestman had not given a separate statement with regard to the electricity works, on which a great amount of money had been expended. Scarcely a month passed without something having to be voted for expenses in connection with the works.

Mr. Galloway also wished to ask why they could not have a separate balance-sheet for the electrical works. He had heard that this time there was a loss of £2000; but he did not know whether or not this was correct.

Alderman Priestman said, with regard to the electricity works, that he had given a statement of the loss accrued to Dec. 31 last; and he hoped to present a statement at the end of the present year. So far, the loss was short of £1000. The electrical department had never been expected to pay in its earlier stages. An engine was now being laid down which would increase the output without augmenting the working cost; and he expected that in a few months the statement would be very much better than it would be if presented now. If the Council would appropriate a sum of say £10,000 from the profits of the Gas Department for the benefit of the electric lighting works, they could be made to pay their way. With regard to the mains and services, which stood at the large sum of £177,000, he believed they had value for every penny of the money. He hoped that ere long the Committee would be able to show that the electric lighting department was paying its way; but if not, it would be necessary to raise the price to the consumer. There was no cause to regret the steps taken in respect to this question. He had not the least doubt that if they had not taken the powers of supply themselves, they would have had to spend a great deal more money in keeping other people out.

The minutes were then adopted.

ELECTRIC LIGHTING MANY TIMES SUPERIOR TO GAS.

Under this title, M. Paul Hoho read a paper before the recent meeting of the Société Belge d'Electriciens. A translation of it appears in the *Electrical Review* of the 5th inst.; and its publication is alluded to in these words: "We wonder what complexion the gas journals will put upon the results which M. Paul Hoho describes? Is it possible that the author may have based his conclusions on false premises? If so, we shall soon see them opposed by our contemporaries." The paper is as follows; and reference is made to it in another column of the JOURNAL to-day:—

At a conference which took place a short time since in connection with the general assembly of the Union of Engineers graduated at the University of Louvain, I had occasion to make a comparison between certain figures relative to the yield of an electric incandescent lamp and a jet of gas. I was greatly surprised at the astonishment which my conclusions evoked, even amongst electricians; and I was induced thereby to repeat my calculations in our Society, with a view to raising a discussion so as to accentuate the affirmative character of the conclusions which might result. In any case it is well to proclaim aloud, and to reiterate, figures which ought certainly to find a place on the leading page of every engineer's pocket book. The matter is one of extreme simplicity, and, frankly, I ought to apologize to you for introducing one so elementary.

The entire question reduces itself to this: What amount of energy is required by an incandescent lamp on the one hand, and a gas-jet on the other, in order to produce an equal amount of light—for example, an amount equivalent to 16 candles?

Allow me to make a slight digression for the purpose of assisting somewhat in preparing gas for the sentence which is about to be pronounced upon it by figures which admit of no appeal. The action of the incandescent lamp is based upon the fact that the energy of the electric current in traversing its filament is transformed, by reason of the resistance offered by the latter, into calorific energy, which emanates from the filament in the form of calorific rays. But, as you are aware, a solid body if placed in a certain temperature becomes incandescent—that is, a part of the calorific rays becomes luminous. For the complete utilization of this property, it would be necessary to attain to such a temperature that the proportion of the luminous rays to the total radiation is the maximum. Unfortunately, the physical constitution of the filament, as we actually possess it, does not admit of its being placed above a certain temperature; and we are compelled, therefore, to moderate the action of the electricity in the lamps. The incandescent lamp, as far as it goes, is consequently very far from realizing our ideal; and in order to bring about its perfect action upon this principle, electricity is compelled to await the progress of chemistry, which I hope will one day give us a body upon which electricity will be able to exercise its action without restraint. I will not expatiate upon what may be reasonably expected by electricity upon this head, but will base my calculations upon results as they have been actually obtained.

As regards the gas-jet, I would first of all remark what a singular idea was that which sought to light up the universe by means of a flame. A flame, as you are aware, is essentially composed of gaseous elements, in which is found a comparatively slender quantity of solid particles. Now, we learn by physical science, that from gas, at whatever temperature it may be carried, emanates very little or no light. All its rays are calorific; and the light which emanates from the flame is exclusively composed of solid particles, notably carbon. Is it possible to imagine a more irrational method of lighting? You may attempt to excuse it by saying that it has for a long time been the only one we knew. I admit the excuse, and even that it is a serious one; but you must also confess that it is the only one.

A priori, we are in a position to foresee the wretched result to be had from a gas-jet; and it only remains to compare the figures. An incandescent lamp of 16-candle power consumes at its terminals 2, 2¼, 2½, 3, to 3½ watts per candle, or, 32, 36, 40, 48, to 56 watts for every 16 candles, which amounts to 3·2, 3·6, 4, 4·8, 5·6 kilogrammetres per second for every 16 candles. On the other hand, a 16-candle power gas-jet consumes 180 litres and more per hour. Now, a cubic metre of gas, by its combustion, gives out 6000 calories (according to M. Fresca's calculation), and 180 litres will give out $6000 \times \frac{180}{1000} = 1080$ calories; 1080 calories = $1080 \times 424 = 457{,}920$ kilogrammetres, which a gas-jet consumes per hour—that is, $\frac{457{,}920}{3600} = 127{\cdot}20$ kilogrammetres per second.

It only remains now to compare this consumption of energy with that of an incandescent lamp, as set out below—

$$\frac{127{\cdot}20 \text{ kilogrammetres}}{3{\cdot}2} = 39{\cdot}75;$$

$$\frac{127{\cdot}20 \text{ kilogrammetres}}{3{\cdot}6} = 35{\cdot}28;$$

$$\frac{127{\cdot}20 \text{ kilogrammetres}}{4} = 26{\cdot}50;$$

$$\frac{127{\cdot}20 \text{ kilogrammetres}}{5{\cdot}6} = 22{\cdot}70.$$

From these I conclude that, in order to produce a luminous intensity of 16 candles, a gas-jet consumes 22·71 to 39·75 times more energy than an incandescent electric lamp, counting the latter at 2 to 3½ watts per candle, and the consumption of gas at 180 litres per hour. I conclude, further, that the incandescent lamp supplies an illumination absolutely 22 to 40 times that of a gas-jet. That is all I had to prove; and I could content myself with pointing out that, to destroy these conclusions, it will be necessary to invalidate the preceding figures, which is, I repeat, impossible. However, as I foresee myself being answered in the eternal phrase of "theory and practice," I will dwell a little longer upon the matter than it really demands.

In the above conclusion, I have specified all that the figures teach. They tell us nothing more; but, above all, nothing less. We therefore have it that the incandescent lamp constitutes a transformer for the production of luminous energy 22 to 40 times more perfect than the gas-jet, comparing the two individually without regard to the production of energy by the one, or of gas by the other. This is the first thing to be established.

Next, as regards the production of electric energy and the production of gas. Energy is present in Nature under various forms; under that of chemical energy in carbon and other bodies, as calorific energy, as the energy of gravitation and of masses in movement—for example, the fall and flow of water. Gas can only be obtained from coal, and in certain cases where it is already existant in nature; whilst it cannot be drawn from energy which exists in other forms, unless in the most roundabout and impossible way. Electric energy, on the contrary, may be obtained by the transformation of energy existing in any form, with various results. Thus coal may be transformed into electric energy by a series of transformations yielding a feeble result, which is successively diminished by each transformation. The mechanical energy which may be employed upon a shaft moved by a fall of water may be transformed into electric energy, and afford results unknown in any other industry—85, 90, and even 93 per cent., for instance. Therefore, in comparing electricity with gas, it would be absolutely unreasonable to deal with energy as existing under one form only.

If gas, for the sake of a cause which is otherwise indefensible, demands that the comparison be made from the standpoint of the energy of coal compared with that of gas, electricity will not shrink from the comparison. But should electricity in its turn call for a comparison with other forms of energy, the protests of the advocates of gas would only be equalled by the disastrous results to their clients. However, for the production of light, it suffices on principle to have a suitable transformation of energy, nothing but energy; and this as much as possible free from carbon fumes and from the emanations of carbonic acid and other similar products whose influence is little beneficial. It is true that coal is to be found in large quantity in Nature, and that in this country, as a rule, it offers the most economical and convenient form of energy for our needs. But we are not merely arguing the case of Brussels; and without admitting the hypothesis that some day or other we shall have to make use of the Niagara Falls, we have still in this country waterfalls and flows which could be easily utilized, and which have, in fact, been so very frequently.

We by no means decline to institute a comparison with gas on the standpoint of coal or of gas even; but first let us point out the insufficiency and exclusiveness of the comparison. Thus, 10 kilos of coal furnish a maximum of 3000 litres of gas, or a quantity sufficient to feed 10 jets of 16-candle power during one hour and forty minutes. To produce electric energy from coal, we are obliged in the first place to transform, by a series of transformations, the energy of coal into mechanical energy, and next into electric energy. With the aid of a good condensing engine, 10 kilos. of coal will furnish 8-horse power hours upon the shaft, by means of which the dynamo electric machine will furnish 8-horse power hours × 75 kg. × 9·8 watts × 80 per cent. = 4800 watt-hours, or the amount of energy necessary for supplying 10 incandescent 16-candle lamps during 8¼ to 15 hours.

Result in favour of electricity:

$$\frac{8\frac{1}{4} \text{ to } 15}{1\frac{1}{8}} = \frac{5\frac{1}{7} \text{ to } 9}{1}$$

And, moreover, the first transformations of the energy, up to the driving shaft, before electricity had come into play, had only furnished a total rendering of 10 per cent. In fact, 1 kilo. of coal gives an immediate yield of 5000 calories = 2,120,000 kilogrammetres, whereas upon the driving shaft we have 0·8-horse power hour × 75 kg. × 3600 s = 216,000 kilogrammetres, which gives a rendering of

$$\frac{216{,}000}{2{,}120{,}000} = 0{\cdot}10 = 10 \text{ per cent.}$$

Let us now make the comparison on the score of gas—that is, by employing the 3000 litres of gas produced by 10 kilos. of coal on the one hand directly in the gas-jets, and on the other for producing, by means of various transformations, electrical energy for the supply of incandescent lamps. The 3000 litres of gas will supply, it is said, ten jets of 16-candle power during one hour and forty minutes. On the other hand, they will supply upon the driving-shaft of a gas motor $\frac{3000}{700} = 4{\cdot}286$-horse power hours, by means of which the dynamo will furnish 4·286-horse power hours × 75 kg. × 9·8 watts × 80 per cent. = 2560 watts hours, or the amount of energy required for supplying 10-16 candle incandescent lamps during 4¼ to 8 hours.

Result in favour of electricity

$$\frac{4\frac{1}{4} \text{ to } 8}{1\frac{1}{8}} = \frac{2{\cdot}74 \text{ to } 4{\cdot}8}{1}$$

And, moreover, the gas-motor, which consumes 700 litres of gas per horse-hour, only returns 15 per cent. yield. In fact 700 litres of gas give immediately

$\frac{700}{1000} \times 6000 = 4200$ calories = $4200 \times 454 = 1{,}780{,}800$ kilogrammetres; whilst on the driving-shaft they gave 75 kg. × 3600 = 270,000 kilogrammetres, or $\frac{270{,}000}{1{,}780{,}000} = 0{\cdot}15 = 15$ per cent.

These figures point their own conclusions sufficiently clearly, precisely, explicitly, and instructively to be developed by us. I have only to point out what follows as a consequence: (1) The loss which occurs in obtaining electric lighting by means of coal or gas, is not to be attributed to electricity, but to the successive transformations of energy with very slender results before electric energy is obtained. (2) Directly electricity comes into play—that is when mechanical becomes transformed into electrical energy—the yield is enhanced to 80 per cent., as mentioned in my calculation, and may in fact reach to 85, 90, and 93 per cent. and more. (3) Therefore in spite of the preliminary very unfavourable transformations of electricity, a total result is obtained which is notably superior to gas, as I have shown in the foregoing figures.

These will be found to gain in importance and to accentuate the advantages of electricity, if we take into consideration the following three facts: (1) The transformation of energy in general in all these

forms makes continuous advances. Whilst these advances constitute an immediate advance for electric lighting, they bring with them no advantage for gas lighting. It is true that gas is in no way prejudiced by the transformations undergone by it before its utilization; but its failure consists entirely in its employment as a lighting medium. (2) The transformation of electric energy is making rapid progress. The same cannot confidently be said of gas, which after over a hundred years of use, finds itself already outstripped by a luminant which hardly counts an existence of ten years. (3) Electric energy is peculiarly transportable from long distances, a fact which enables it, and will enable it, to overcome local circumstances disadvantageous to its production, by enabling its production in localities where the conditions are more favourable.

THE SUPPLY OF GAS BY MUNICIPAL CORPORATIONS.

The following is the article on the above subject, contributed by "A Citizen" to the *American Gaslight Journal*, to which reference was made in our editorial columns on the 5th ult.:—

From the attention paid in the last few months to the subject of Municipal gas lighting, and the numerous papers written on it for the various conventions, it would appear that the tendency toward the absorption of the gas industry by the different municipalities has created some alarm among the fraternity. Naturally, the project finds few, if any, friends in the business; but the arguments on the subject will vary according to the source from which they come. Thus the stockholders who, by a wise selection of capable men for offices, have built up a business on a substantial basis, and are satisfied with their returns, and the safety of their investment, will, of course, oppose any scheme leading to a surrender of their property. On the opposite side are the grand armies of politicians, great and small—chronic feeders at the public crib—who see, in the public administration of the business in question more opportunities for a division of the spoils and payment for services rendered at elections. Another party interested in the subject is the consumer, who, holding fast his ancient prejudices against gas companies in general, sees in the change a possible reduction of his bills, and the total discomfiture of his old-time enemy. What the result would be, if the gas and electric business in the city of New York were delivered over to the municipal authorities, no one conversant with existing facts can doubt. Without question, any one of the different municipal departments could be better administered at a saving of at least one-third of the present cost. The faction in possession at present, whose motto is "To the victor belongs the spoil," would hail with delight a change by which their peculiar field of official robbery would be greatly enlarged.

It is argued by some that the reason why a city should control and administer the departments of health, fire, police, water supply, street cleaning, charities, &c., apply equally to the supply of light. This would be the fact if the public lighting only is considered. But private lighting is an entirely different matter; and the use of the streets for mains and services does not affect the subject any more than the use of the streets by public hacks, railroad cars, &c., affects the private ownership of those industries. It is right and proper that those who use the public streets should pay a proportion of the cost of paving; and it is proper that gas companies should be compelled to repair the streets after they have torn them up. A paper on this subject, stating the facts clearly and in a very able manner, was read by Mr. Herman Wilkiemeyer at the recent meeting of the Ohio Gaslight Association.* He says:

The *rationale* of the construction of the social fabric precludes the exercise by the municipality of all functions but those that are police in their nature and tendency. Wherever a departure from this rule occurs, then liberty suffers, and another item of natural personal liberty is sucked into the great vortex of centralization of power. It is, therefore, wrong, on first principles, for a city to engage in any other occupation or business than that for which cities or communities or society was originally established. The centralization of affairs in the Government is eminently unwise; for there is no limit to the venture. If the city has an inherent and political right to go into the lighting business, it has also the right to go into the coal, clothing, and grocery business. . . . By absorption of all business the Government would become parental in its nature. Ambition would have no place in our make-up; and we would be a nation of nonentities. . . . The question of the advisability of a city's owning and operating a gas light or an electric light plant is pre-eminently an economic and practical one. It may safely be laid down as an axiom, that whenever a city embarks in any venture that even savours of money-making it is either exceeding its legal powers or is encroaching upon rights never ceded by the people. Looseness and carelessness are almost inevitable in the management of a city lighting plant.

The temptation to quote further from this excellent paper is great; but space will not permit.

In the *Century Magazine*, for March, 1890, is an exhaustive article, by a writer who is enthusiastic on the subject of municipal control, which, under the title of "Glasgow: A Municipal Study," touches incidentally on the subject of municipal gas lighting in that city. From this article it appears that the city controls the following industries, in addition to those usually under municipal control—viz., model lodging and tenement houses, public bath-houses and laundries, water supply, street railways, public markets, slaughter-houses, and gas supply. In regard to the last mentioned, the writer says:

In the year 1869, after much difficulty in adjusting the details of the arrangement, the gas supply was transferred from private hands to the Corporation, to be managed by the Council as an ordinary department. The original cost was $2,600,000. Twenty years of management by the authorities has given unmitigated satisfaction to all the citizens of Glasgow. [This statement throws a cloud of doubt over the whole article in question. That a gas company, whether public or private, could give satisfaction, and unmitigated satisfaction, is an impossibility. The chronic "kicker" is not easily extinguished.] The quantity of gas sold has increased from 1036 million cubic feet, in 1869–70, the Corporation's first year, to 2427 million cubic feet in 1877–8—an increase of 140 per cent.; while the population has grown only 20 per cent. The amount of gas unaccounted for in 1869–70 was 20 per cent. Careful management has reduced this amount of leakage to about 10 per cent. [This statement is also subject to doubt as to its accuracy, as "Field's Analysis" of recent date shows that the gas unaccounted-for per mile of main exceeds that of the three London Companies and the Corporations of Birmingham, Leicester, and Manchester.] More than 130,000 meters are in use, and as it is not the policy of the Corporation to *charge its customers for more than they actually consume*, it is inevitable that there should be a considerable percentage of loss in delivery. [From the portion of the above which is put in italics, it seems that our author must at some time have been a "kicking" consumer himself.] From $1.14 per 1000 cubic feet, charged for gas in 1869, the Corporation has been able to make reductions year by year, until, for 1888–9, the price was fixed at 66c. No one will claim that a private company would have made these reductions, while continuing to supply a satisfactory quality of gas. [The chronic "kicker" knows it to be a fact that a gas company always reduces the quality when it reduces the price.] A peculiar feature of public illumination by the city of Glasgow is stated as follows: The authorities some years ago entered upon the policy of lighting private courts and passages as well as public streets, and further undertook the lighting of all common stairs in tenement houses. The stair lighting costs the city more than the lighting of all the streets, counting wages and gas. It should be said that the expense of stair lighting is partly met by special assessment.

Granting, for argument's sake, that everything connected with municipal gas lighting in Glasgow is as rosey-hued as this writer states, on an investigation of his paper we find a reason for it in the very different class of office-holders there from what we have in this land of universal suffrage, which, however good in theory, is very bad in practice. He says:

In considering the effect of the franchise upon the city government, it is to be borne in mind that not only is the mass of unmarried workmen excluded, but also all others who have failed to pay their rates. This is a point of enormous importance, for I have ascertained that in Glasgow last year no less than 25,000 householders were disfranchised by reason of non-payment of assessments. About one-third of the householders . . . . fail to pay their rates and never vote. If it was possible to secure reinstatement by payment of arrears as an election approaches, there would be a tempting field of activity opened up to corrupt politicians. But this cannot be done. The better class of workmen in Glasgow, of course, pay their rates, take an active interest in public affairs, and do not fail to vote. But there is a very large population, of the degraded poor, which does not in fact participate in elections, and is not of the slightest service to "ward politicians"—a *genus* which, by-the-way, is rarely found in British cities. What I may call the self-disfranchisement of the slums is an important consideration in Glasgow municipal government. The councillors of Glasgow come chiefly from the ranks of business men, and are respected and successful citizens. No salaries are attached to such offices; and it is deemed an honour to be selected to represent one's ward. Heads of departments are chosen with great care, and their places are practically permanent.

In glaring contrast to this class of managers of municipal gas lighting would be the officers in charge of the gas supply of New York, where two-thirds of the Aldermen are interested in gin-mills, and all of whom hold office for personal greed. What rich openings would be discovered for swindling in the purchase of coal and in the sale of residuals! In fact, our city government has become a byword and synonym for all that is bad; and there are no signs of reformation. A late writer sums up the matter in these words: "Thus it has come to pass that we have developed the monstrosity of a perverted Government—a Government not of the best, but of the worst; not of the noble, but of the ignoble; not of the educated, but of the ignorant; not of the virtuous and God-fearing, but of the vicious and criminal."

A few of our American cities have adopted the system of municipal gas lighting—viz., the cities of Philadelphia (Pa.), Richmond, Charlotteville, and Alexandria (Va.), Hamilton and Bellefontaine (Ohio), and others. In Philadelphia a portion of the gas supply is purchased from a private company, which fact is a positive proof that a private company could sell gas to the consumers at a less rate than the city authorities can. In the case of the city of Hamilton (Ohio), the city has established a plant for lighting the city with gas, and the Supreme Court has decided that the Gas Company has no rights which the Municipality is bound to respect in the matter of competition; and this in face of the fact that the same authorities may dictate and enforce the price to be charged by its competitor. If this example of Russian administration should be generally followed, the gas companies may well feel interested in the subject. The question of municipal lighting having been brought before the Legislature of Massachusetts, a Committee from that body visited the gas-works in several cities. The Committee, in their report, considered it unadvisable to recommend the adoption of municipal control of gas and electric lighting in that State. Speaking of the situation in Richmond (Va.), the Committee said: "It is evident that a limited number of citizens are paying a high price for gas without corresponding advantages to the city." The Legislature also applied to the Attorney-General of the State for his opinion in the matter. The following are extracts from his reply:

Towns, upon general principles as municipal corporations, have no power to levy taxes and assess money upon the inhabitants for general or indefinite purposes, but only so far as the same may be necessary to enable them to exercise the powers, enjoy the privileges, and perform the duties established as before intimated. I can find no law or statute by which towns have been authorized to enter into business of a commercial or private nature, such as requires an investment of capital and the employment of skilled labour or scientific knowledge therein. And I am of the opinion that, under the existing statutes, towns have no authority to construct and maintain within their own limits, and for their own use, systems of lighting by gas or electricity; nor can they, in connection with such systems, sell gas or electricity for private use in such towns.

He also states that the same rules apply equally to cities as well as towns. The Legislature having refused to accept this construction of the laws as final, appealed to the Supreme Court of the State for an opinion on the same question. Briefly stated, the opinion of the Court as to the question whether a city or town has the right to supply light for public use is this: "If they have the right to buy, they also have the right to manufacture light." As to the question of selling light to private parties: "The furnishing of water for cities and towns for domestic use affords perhaps the nearest analogy to the subject. Water cannot ordinarily be supplied to a large city or town from ponds or streams without the exercise of the right of eminent domain, and the use of public ways; therefore the furnishing of water has been considered a public service."

* This paper was noticed in the JOURNAL for May 6 last (p. 836).—ED. J. G. L.

The weak point in this opinion is the assumption that gas or electric light is a necessity, as water is. Continuing, the Court says: "Artificial, light is not so absolutely necessary as water, but it is necessary for the comfortable living of every person. Although artificial light can be supplied in other ways than by the use of gas or electricity, yet the use of one or both is common." When judges disagree, who shall decide? We believe that the matter was left undecided at the adjournment of the Legislature.*

The subject has thus far been considered from the standpoint of a resident of New York. Perhaps other cities have good Governments and honest city officials, who accept office for the public good and not for personal greed. If there are any such officials, it would seem to be the fact that they would be honest enough to see that they had no more right to sell the citizens light than they had to sell beef in opposition to the honest butcher, or to set up a laundry and ruin industrious John from China. There is no doubt that the work of several of the departments now controlled by the city authorities could, and would, be better done by private corporations. The city pays an enormous sum yearly for street cleaning; but it has the name of being very near the head in a list of the dirty cities of the world. Some streets are models of cleanliness. Why? Because they are cleaned by contractors paid by the residents themselves. Comment on this fact is superfluous. Another fact: Millions of gallons of water are wasted every year. Is it to be supposed for an instant that this would be allowed by a private corporation? The waste would be done through a meter, duly recorded, and paid for.

To sum up the matter of municipal gas lighting, and viewing the whole matter of municipal government from the standpoint of common sense and reason, it seems plausible that certain departments should from their very nature, be administered by the Municipality. These departments are for the most part of a police nature, and are for the enforcement of the laws, and for the general protection of the city from fire, epidemics, lawlessness, &c., such as the departments of police, fire, health, charities, and corrections. The water supply, although mainly administered by the Municipality, especially in large cities, is so administered probably by reason of the enormous cost of the plant; but, with the exception of the use of water for fires and for street sprinkling, no other reason against private water companies will hold good. Exactly the same is true of municipal gas lighting. As far as the public lighting of streets, parks, &c., is concerned it might very properly come under the head of a public measure. But the supplying of light to a private consumer, large or small, is a business that the Government may have the right to regulate, but not the right to carry on; and, incidentally, the fact may be stated that no city has the right, although it may have the might, to regulate or fix the prices of any commodity where there is competition.

In conclusion, two axioms, gleaned from Mr. Wilkiemeyer's paper, may be properly quoted. "The motive for private capital to invest in a certain line of business is destroyed when a city enters into the same line of business, and conducts the business with no desire to make a profit." "No man should be willing to be taxed in order that a city should secure capital with which to strangle private enterprise."

DEVELOPMENTS IN GAS-ENGINES.

Within the last few days (says a Manchester contemporary) Messrs. Crossley Bros., of Openshaw, the well-known gas-engine makers, have made a new development in the manufacture of large gas-engines. This is in the form of the completion of a new 30-horse power single-cylinder "Otto" gas-engine, possessing a capability of working up to 100-horse power. It is understood to be the largest of its kind ever made, either in England or on the Continent. All the latest improvements are included in the engine, which is erected on the horizontal plan, and is intended for the Wandsworth Projectile Company, of London. This engine is, however, by no means the largest manufactured by Messrs. Crossley. The double cylinder "Ottos" are now well-known among manufacturers and others for possessing many advantages over the ordinary steam-engine. Engines of this character are made capable of running up to from 100 to 200 horse power. The firm has now in hand several large installations, requiring from 100 to 500 horse power in each case. One of the latter installations will consist of several double-cylinder engines, and will be used for driving the machinery of a large flannel manufactory. The use of gas-engines for this work is a new departure; for it has hitherto been supposed that these engines were not powerful enough for driving machinery on a large scale. The order will be the largest that has ever been placed for engines of this description. With the engines laid down by Messrs. Crossley Bros. is connected the Dowson patent economic gas system, which, in conjunction with the engine, brings down the fuel consumption to less than 1¼ lbs. per indicated horse power per hour. This result has perhaps elsewhere never been arrived at, even by the best and most modern Lancashire mill engines. The machinery in Messrs. Crossley's works has for several years past been entirely driven on this system; and the actual cost of working has never exceeded the above figures. Extensive use of the engines is also made at the works of Sir William Armstrong, Limited, at Elswick. There are about 1000 engines made by the firm at present working in Manchester; and Messrs. Crossley not unfairly assert that, as a result, they have practically aided in the important work of improving the state of the atmosphere of the district. With the production of the latest single-cylinder engine, the firm are now able to provide some twenty-five varieties of engines.

The Lighting of City Bridges.—From the recently-issued accounts of the City Corporation, it is seen that the cost of gas for the lighting of the three bridges across the Thames within their boundary during the past year is as follows: London Bridge, £302; Blackfriars Bridge, £121; and Southwark Bridge, £107.

* As a matter of fact, a Bill to enable cities and towns to provide gas and electricity passed the Lower House easily, but was thrown out in the Senate.—Ed. J. G. L.

THE WATER INQUIRY BY THE CORPORATION OF LONDON.

The Investigation Committee in Manchester and Glasgow.

The Committee appointed by the Corporation of London to inquire into the water question have been continuing their investigations in Manchester and Glasgow, with a view of embodying in the report of their proceedings some particulars as to the water supply of these cities, which, as is well known, is in the hands of the respective Corporations. In Manchester the Committee were welcomed by the Mayor (Alderman Sir John Harwood); and the inquiry was held in the Mayor's Parlour in the Town Hall, under the presidency of Sir GUYER HUNTER, K.C.M.G., M.P.

Mr. *T. H. G. Berrey*, Assoc. M. Inst. C.E., the General Outdoor Superintendent of the water-works, was the first witness. He said there was no restriction of the supply to any house in the city. Since the acquisition of the water undertaking by the Corporation, there could be no doubt that the inhabitants were better off all round. The profit realized went into the general funds. Much benefit had resulted to the public health; and he thought the death-rate had diminished. The water supply was considered one of the best in the kingdom. The high death-rate in Manchester resulted from other causes than the water. For the extinction of fires, the water was always on at high pressure without extra cost. He detailed the various charges made for the water, and the results obtained from Longdendale, which had been visited by the Committee. The money for the purchase of the works was obtained principally on loan; and the surplus of the rates necessarily went to reduce that loan.

Mr. *G. H. Hill*, M. Inst. C.E., Engineer of the works, gave evidence as to the early supply of Manchester with water, and the various circumstances which led up to the taking over of the supply by the Corporation, and the introduction of water from Longdendale into the city in 1851. The present supply was from the Longdendale area entirely, The quantity of water available, after paying the compensation to the river of some 13¾ million gallons, was between 24 and 25 million gallons daily. In the summer time it would run to from 23 to 26 millions. There were reservoirs to cope with the difficulties of a dry summer. Still, as in 1887, there was a possible fear of a water famine. The city was supplied in three zones, which were so arranged that water could be sent from one into the other. The total storeage was 6000 million gallons. When the works at Thirlmere were completed, there would be practically a supply which would be equal to meeting all possible future requirements.

Other evidence was given by Mr. *C. Estcourt*, the City Analyst, Mr. *T. L. Elwood*, Chief Clerk in the Medical Officer of Health's Department, Superintendent *Tozer*, of the Fire Brigade, and Mr. *F. C. Lynde*, a civil and sanitary engineer; and the proceedings closed.

The Committee subsequently went to Glasgow; and, having visited the principal source of the water supply of the city—Loch Katrine—took additional evidence.

Mr. *J. M. Gale*, M. Inst. C.E., the Engineer to the Glasgow Water Commissioners, was the first witness; and he gave particulars as to the history and development of the water undertaking. He stated that before the water supply passed into the hands of the Corporation, it was managed by private enterprise. The first Company was formed about the year 1806, and was called the Glasgow Water Company. Another Company—the Cranstonhill Company—was formed in 1808. Both these Companies completed their works about 1809, when they began supplying the city and competing with each other. The competition lasted till 1834, when they came to an agreement that they should no longer oppose each other. In 1834 they sought to have this agreement confirmed by Parliament; but the Corporation of Glasgow opposed the Bill, as the competition was thought to be beneficial to the city. Four years afterwards, the Companies, having conceded some things, the works were amalgamated by an Act then passed. In the year 1845-6 another Company was formed—the Gorbals Gravitation Company—for the supply of a portion of the south side of the river. The Glasgow Water Company drew their water from the Clyde about 4½ miles above Glasgow Bridge. This water was never very satisfactory—inferior as to quality, though as to quantity there was not much to complain of. The Cranstonhill Company originally took their supply from the river below the bridge; pumping the water up to Cranstonhill. But in 1819 the river became so much fouled that they shifted their works to a point 1½ miles below the Glasgow works. The water of neither Company was satisfactory. The amalgamated Companies continued, with the Gorbals Company, to supply the city till 1860, when the supply from Loch Katrine was introduced by the Corporation. The Companies' undertakings had been purchased by the Corporation a few years previously. The Gorbals works were situated near Barrhead, about seven miles from Glasgow; the supply being drawn from a small mountain stream. Witness went on to refer to the Bill promoted in 1852-3 for obtaining water from Loch Lubnaig. This Bill, he said, was opposed by the Corporation, who in 1853-4 brought in a Bill to obtain water from Loch Katrine, being advised that it was very much superior to that of Loch Lubnaig. The Corporation Bill gave rise to very extensive opposition, embracing a large number of interests. The result of a very lengthened inquiry was that the House of Commons rejected the Bill, and gave the Corporation another year to endeavour to make terms with the existing Companies. In the following year—1854-5—the Corporation went with another Bill, having settled with one of the Companies and arranged with the other that they should have an arbitration to determine the value of the works. The Bill of 1854-5 became the first Water Act; the Corporation having purchased the Companies in 1855. In the case of the Gorbals works, annuities were granted at the rate of 6 per cent. per annum on the authorized capital of £180,000. The case of the Glasgow Company was submitted to arbitration, as the result of which perpetual annuities were granted at the rate of 6 per cent. per annum on their preference, and 4½ per cent. per annum on their ordinary stock, while a mortgage debt of £75,000 or £76,000, chiefly on the works of the Glasgow Water Company, was simply transferred to the Corporation. Witness handed in a return showing the population of Glasgow, and the consump-

tion per head per day, for the year 1861. When the old works passed into the hands of the Corporation in 1855, the population was 360,000; the consumption of water per head per day being 39 gallons. Now the population is 800,000, and the supply close upon 50 gallons per head per day. All the Scotch towns, he said, used much larger quantities of water than the English towns; and the reason he took to be that in Scotland people live in flats, and the necessity of having a full supply was very great. There were no back doors—everything had to be done inside the houses; and so there was a tendency on the part of householders to use the water recklessly. Even in small houses in Glasgow—houses of £10 and £12 rental—there were baths, shower as well as plunge. The water supply of Glasgow was now obtained entirely from Loch Katrine, with the exception of 4½ million gallons from Gorbals. The Gorbals supply was still continued; the filtration having been greatly improved since the works passed into the hands of the Corporation. They had tried to reduce the consumption of water for domestic purposes in the city, and had failed; and the consumption for trade purposes had enormously increased. Consequently, they had been obliged to undertake new works. These, which, with the original works, he proceeded to describe, would enable the Corporation to increase the supply to 100 gallons per head per day. London water was sixteen times harder than that of Glasgow. When the present extensions were completed, the Corporation would have spent about £2,500,000 sterling in connection with their water-works.

Mr. *R. Wilson*, the Treasurer of the Glasgow Water Commissioners, detailed the arrangements made with the shareholders of the Glasgow Water Company, the dividends paid by the old Companies, their revenue, and the amount of the public water-rate since the Corporation took over the supply. The revenue of the Companies in 1848-9 was £33,928; that of the Water Commissioners last year was £171,256. In 1856-7 (the year after the old works were taken over) the public water-rate amounted to £4900; last year it amounted to £12,964. He afterwards explained the basis of the assessment for trade purposes. As to the domestic rate, he said that in 1856-7 it was 1s. 2d. on the north side of the river, and 1s. on the south, with the same rate outside the municipal boundary. In the current year it was 6d. within, and 10d. beyond the city. No charge was made for water supplied to charitable institutions. As to borrowing, the Corporation could borrow at a very low rate indeed. Their power of rating on the north side of the river was unlimited; so that the security was first-class.

Dr. *Tatlock*, City Analyst, afterwards gave the results of analyses of Loch Katrine, Gorbals, and Clyde water. Loch Katrine water, he informed the Commissioners, contained a very small proportion of lime ingredients. The degree of hardness was 7; that of the Gorbals water 5; and that of the Clyde water 9¾. The latter contained a large amount of carbonate of lime; and there were also traces of sewage in it.

Mr. *Paterson*, Fire Master, said he had never had any occasion to complain of want of water at fires in the city. The service-pipes in all the streets where warehouses and large works were situated were large, and there were upwards of 4000 hydrants in the city.

In the absence of Dr. Russell, Medical Officer of Health, it was resolved to formulate a series of questions to him on the effect of the water supply on the public health.

The inquiry was then adjourned till the 22nd inst., in London.

Proposed Increase in the Price of Gas at Fleetwood.—The Fleetwood Gas Company have given notice to raise the price of gas by 3d. per 1000 cubic feet; the reason assigned being the increased price of coal. The notice has given much dissatisfaction; and the Town Commissioners are being urged to take some decided action to secure another method of lighting the town.

The Pemberton Local Board and Electric Lighting.—By way of experiment, the Pemberton Local Board have accepted an offer from a firm of electricians to light about 400 yards of Ormskirk Road with one arc lamp and six incandescent lamps for two calendar months, at a cost of £20; the Board also providing the engine power and poles, and labour to assist in the fixing of the poles and wires.

The Quality of the Tar Produced under the Dinsmore Process.—In moving the confirmation of the minutes of the Gas and Water Committee at the meeting of the Widnes Local Board last Tuesday, Mr. Brown made a remark which will interest many gas engineers. He said that it was satisfactory to know that they were obtaining a better return from their tar than formerly; the price now being £1 10s. 3d., as compared with £1 9s. last year. This tar was produced by the Dinsmore process, in regard to which it had been said that the tar would be of an inferior quality. The minutes revealed the fact that four new settings of retorts are now in course of erection on the Dinsmore system.

Gas Exhibition at South Petherton.—Under the auspices of the local Gas Company, an exhibition of gas appliances has been held at South Petherton during the past week; and in conjunction therewith a course of free cookery lectures has been given. The exhibition was opened on Tuesday night by Dr. Norris, the Chairman of the Company, who in a few well-chosen words introduced Miss Kelman (the lecturer) to a large audience. Miss Kelman addressed the meeting for nearly an hour and a half; and at the same time prepared some choice dishes. At the conclusion of the lecture, the Company's Manager (Mr. Thos. Stormont, F.C.S.) explained the economy of gas for cooking and other domestic purposes, and informed the audience that the cooker used by Miss Kelman had only registered five farthings' worth of gas. Dr. Norris then remarked that he had been connected with gas-works for many years; and he was ashamed to admit that he knew so little about gas before their new, able, and energetic Manager came to South Petherton. There were many interesting appliances in the hall he had never seen before; and they had Mr. Stormont alone to thank for having promoted the exhibition. The stoves exhibited were lent by Messrs. Fletcher and Co. Messrs. Sugg displayed a number of Cromartie lamps which were much admired. The "Meteor" and "Etoile" lamps were also on view; and the "Clapton" lights shown by Messrs. Halliday were much praised.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

A species of labour question has arisen in the Edinburgh Gas-Works which the Commissioners had better look to, because in these days of workmen's agitations, the individuals who constitute themselves the "leaders" of the employees—acting apparently on the principal that "any stick is good enough to beat a dog with"—are ready to seize every opportunity for giving annoyance to employers. A body calling itself the Edinburgh Gas Workers' Association, of whose existence the community were unaware, met on Thursday night to take into consideration the question of relieving the pressure of work in connection with the new bench of regenerative retorts in the gas-works. The meeting was presided over by Mr. A. Maclean, of the Edinburgh Trades' Council, which for the past two years has done its utmost to stir up agitation among working men, under the plea of "organizing" the forces of labour. An account of the proceedings states that, "complaint was made by several of the speakers that, at the new bench of ovens, two workmen had to work four retorts; and they were of opinion that three were sufficient for two men to work. Another grievance ventilated was against the foremen of the shifts, who, it was stated, competed with each other as to who should produce most gas, with the result that what they considered undue pressure was brought to bear on the staff. The remedy they thought of was to weigh out the coal for the shifts. Another point brought before the meeting had reference to the cleaning of what was called the 'hole' below the retorts into which the coke fell when the charges were 'drawn.' The hole had to be cleaned out at the end of every shift; and the operation was said to occupy six or eight minutes. It was stated by one of the speakers that the heat of the hole was so great that he could not lay his hands on the ladder by which he got down, and had to grasp it with his bonnet. A resolution was adopted unanimously resolving to memorialize the Manager that three ovens were quite sufficient for two men to work, and that the coal should be weighed, as at present the work was excessive. It was further agreed to appoint a deputation to wait on the Manager, and to lay the men's complaints before him."

The question of charging gas companies for way-leave for their mains, which has been cropping up in more than one Scotch burgh of late years, has in Peebles got into a state of acuteness surpassing anything it has yet reached in any other place. For some months past a correspondence on the subject has been in progress between the Police Commissioners and the Gas Company. The Commissioners claim £25 a year for way-leave; and the Secretary of the Gas Company has written to the Town Clerk stating that the Directors deny the right of the Commissioners to charge rental for the use of the streets, but offering to pay for leave to open the streets, at so much per opening, to keep up the town's lamps, give 10 per cent. off accounts for gas, and pay half the cost of lighting the town clock. The Commissioners, while agreeing to such terms as part, still claim the £25 per annum for the use of the streets. The Clerk was on Monday night instructed by the Council to write accordingly. At Galashiels, the same question came before the Corporation in a correspondence with the Gas Company, which was read. The Company asked under what authority the Corporation made their claim, and were informed that it was under sections 36 and 40 of the Local Act; the Corporation at the same time asking the Company under what authority they claimed to open the streets. There the question remains at present.

A rather ingenious method of mending the skin of a gasholder has been adopted by the Perth Gas Commissioners, on the advice of Mr. Donald, of Paisley. Last winter one of the plates in a gasholder gave way; and it is proposed, instead of removing the plate, to let it remain as it is, but to cover it over inside with a boiler plate bedded in cement and screwed on from the inside. This is accepted as the strongest and least expensive method of repair; and it is to be carried out.

The annual meeting of the St. Andrews Gas Company was held yesterday, when the profit for the past year was reported to amount to £1524 5s. 9d. It was resolved to pay a dividend at the rate of £2 10s. per share, which is equal to 25 per cent. upon 424 £10 shares. The profit for the previous year was £1334; so that the Company has again had a prosperous year. The Chairman stated that the price of coal had risen nearly one-third; and it would therefore be necessary to reduce the discount by 3d. per 1000 feet. The price of gas at present, under deduction of discount to the consumers who paid within one month, was 3s. 6d.; and in future it would be 3s. 9d. As the Company made no charge for meters, which was equivalent to 1¼ per 1000 feet, this reduced the actual price to 3s. 7½d. The amount charged by the Edinburgh Corporation, who had recently acquired the control of the gas-works, had been fixed at 3s. 9d. per 1000 feet, besides the usual charge for meters; so, keeping in view that St. Andrews was further removed from the coal-supplying districts, he thought that the price of gas in the city was extremely moderate. Coal would cost the Company between £400 and £500 more than in the past year. The shareholders were much indebted to Mr. J. Hall for the excellent way in which he had conducted the business of the Company, which had steadily progressed during his connection with it for the past forty years. The Chairman is under a mistake with reference to Edinburgh, because there the charge for meters was abolished a year ago; and consequently the two places are now on a footing of equality as to the price of gas. This slight mistake, however, does not detract from the Chairman's statement that the price of gas is extremely moderate in their city.

It is not often that one hears of a gas company declining a supply of gas; but this has just taken place at Tain, where a dispute has arisen between the Town Council and the Gas Company with reference to the lighting of the public lamps. The lamps were formerly lit by the Gas Company at a charge of 28s. per annum for each evening lamp, and 60s. per annum for each all-night lamp—the amount paid last year by the town for the lighting of the streets being over £134. This season the Company intimated to the Town Council that, owing to the present unsatisfactory state of the gas-works, they are unable to supply the public lamps with gas. In order to endeavour to settle matters, the Council offered to increase their rate of payment to the Gas Company—the rate for the evening lamps to be 34s., and the all-night lamps

72s.; but this offer the Directors have declined to accept, and the lamps have not been lighted this season.

The Edinburgh and District Water Trustees had an important meeting on Thursday, at which they ratified the proposal to refer the question of an additional supply to Mr. Hill, of Manchester, and Mr. Gale, of Glasgow. Some objection to the appointments was taken by Mr. Auldjo Jamieson, who is opposed to the procuring of an additional supply; and he moved that Mr. John Taylor, of Great George Street, Westminster, the Engineer to the New River Company, should also be appointed Consulting Engineer. This was opposed by Bailie Archibald, of Leith, the Commissionerof the Works Committee. They had, he said, two Engineers of their own; and if Mr. Taylor's name were added, that would make five, which he characterized as ridiculous. Lord Provost Boyd counselled the Trustees to act harmoniously, in view of the negotiations they would have to enter into at Westminster; and the meeting rejected Mr. Jamieson's proposal. Messrs. Leslie and Reid, C.E., the Engineers, proposed that a pipe be laid from the incoming streams at Gladhouse reservoir, to the measuring-house, at a cost of £6000, exclusive of way-leave and surface damage, to enable them to avoid the pollution by clayey matter which is brought down from sheep drains on the Moorfoot hills in time of flood. The water in the reservoir, it was stated, was in time of flood, totally unfit for filtration, the mud and dirt which were brought down mixing with the vegetable and peaty matter in the loch, and rendering the filters useless in 24 hours. This brought out the remark by Bailie Steel, that the Moorfoot water was turning out as bad as it was prophesied to be when it was proposed to bring it in. The subject was sent to the Works Committee to consider.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

At a meeting of the Dumbarton Gas Corporation, held on Wednesday evening, the usual annual report of the local gas supply undertaking was read. In it regret was expressed by the Gas Committee that a considerable advance had been made on the price of gas coal—so great, indeed, that the gas profits at the next balance will be materially reduced. Notwithstanding the increased cost of the coal, it is not proposed to increase the selling price of the gas, which is 3s. 3d. per 1000 cubic feet to ordinary consumers, and 2s. 9d. for what is used in the public lamps. The Gas Committee, as per minute of the Corporation, of Sept. 18, 1889, reported that they had paid out of the surplus profits the sum of £300 to the Common Good of the burgh, to be applied towards the upkeep of the Public Park. Provost Baptie remarked that this year the Clyde Pier would require £200 of the gas profits; and the Common Good would have to do with less. The books showed a profit of £1489 for the past year; and only 18s. 7d. of bad debts. Such a remarkable fact shows in a most striking manner that Mr. M'Gilchrist looks as efficiently after the payment of the gas accounts as he does after the manufacture and quality of the gas itself.

It has been resolved this week by the Gourock Corporation Gas Committee to recommend the Burgh Commissioners at their next meeting to reduce the price of gas 2d. per 1000 feet. Of course, there is not the least likelihood of the Commissioners declining to act up to the recommendation. This reduction will bring up the total amount which the Commissioners have abated in the price of gas, since they acquired the gas-works four years ago, to 7d. per 1000 feet. The price will now be 4s. per 1000 cubic feet. For this year's coal the increase in the price is nearly £200, or an average of about 2s. per ton over the cost of the same varieties of coal as were used last year. It is worthy of mention that the past year's sales of gas showed an increase of about 20 per cent., as compared with the sales in the year 1888-9; which is largely due to the extension of the Caledonian Railway into Gourock, and the erection of a large station at the edge of the Firth of Clyde for the accommodation of people travelling to and from the watering places further down the Clyde. It is thus seen that gas affairs in Gourock are in a very flourishing condition; a reduction in the price of gas being quite an exception to the rule in Scotland, alike with Companies and Corporations.

The Johnstone Burgh Gas Commissioners at the ordinary monthly meeting held last Monday night, unanimously agreed that the price of gas should remain the same as it was last year—namely, 3s. 11d. per 1000 cubic feet. The minutes submitted to the meeting showed that the purchase of coals for the year had been completed; and that the Convener had been successful in getting a reduction of £77 off the prices given in the tenders selected. For the zeal and diplomacy which he had displayed in this matter, the Convener, on the motion of Mr. Cook, seconded by Bailie Armour, was awarded the thanks of the Commissioners, which were ordered to be recorded in the minutes.

On the same evening, the monthly meeting of the Port-Glasgow Town Council was held, at which the Gas Committee's minutes were up for consideration. The principal item in them had reference to the continuance of the visits of Mr. R. R. Tatlock, of Glasgow, to make independent tests of the illuminating power of the gas. It had been agreed by the Committee that he should be asked to visit the works and report on the gas once every fortnight during the months of November, December, and January; his fee to be the same as last year—namely, £1 1s., with 2s. 6d. travelling expenses for each visit. After the adoption of the minutes had been moved, Mr. M'Laughlan objected, saying that he did not consider it was right that they should spend the ratepayers' money in the way proposed by the Gas Committee. His own opinion was that they did not require Mr. Tatlock, and by dispensing with his services they would save a considerable sum of money. It was spending money for what might be called the supervision of their Gas Manager. Mr. Macfarlane said that since Mr. Tatlock had been asked to visit the works and make reports on the quality of the gas, the complaints by the consumers had been less frequent. The same thing was done, he said, in other places; and by obtaining an independent report from that of the Manager, both the Commissioners and the public were satisfied. Bailie Simpson gave his approval of Mr. Tatlock's appointment; and he remarked that it was a singular thing that they had fewer complaints about the gas last year than they had had for many years. What might be the cause, it was left for individual members to judge; as for himself he was satisfied that the money was well spent, and that it was advisable to continue to do as they had been doing. There was some further discussion on the subject; but the minutes were eventually passed.

Business has been very steady this week in the Glasgow pig-iron warrant market; and the price of Scotch iron has advanced from 48s. 10½d. on Monday to 50s. 5d. per ton cash, which was paid yesterday. The advance in the price has been chiefly due to a movement on the part of the blast furnacemen in favour of a change in their shift hours and Sunday labour.

There has been much disorganization in the Lanarkshire coal trade this week owing to the miners taking idle days to further their demand for an advance of wages. They are asking 1s. per day of a rise, and it is not unlikely they will get half this amount. The prices of coal remain very firm.

A local report of the sulphate of ammonia market for the past week says: The sulphate of ammonia market for the week is without any special feature. Little business has been passing; and the price, if anything, is rather easier. Several sales at £11 12s. 6d. per ton, usual terms, f.o.b. Leith, are reported; but sellers in most cases are holding off in expectation of higher prices. For forward delivery, the demand is slow.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 13.

Sulphate of Ammonia.—The market has been somewhat dull, owing to the absence of orders; and the values of prompt parcels are therefore slightly easier. The German autumnal demand has evidently been considerably reduced, seeing the scarcity of orders from this quarter; but the conclusion may be drawn that the requirements will be all the heavier later. Buyers generally seem inclined to maintain a passive attitude; and there is very little movement on the part of speculators—the future of the market being at the present moment most difficult to define. Owing to the fine weather, there is no great increase in the production as yet; and while this lasts, prices will probably maintain their present level. Country quotations generally range to-day at £11 10s. to £11 12s. 6d.

LONDON, *Sept.* 13.

Tar Products.—Benzoles have been somewhat weaker during the past week. However, 4s. 3d. and 3s. 4d. may be taken as the respective values of 90's and 50/90's. Anthracene is unchanged, at 1s. 6d. for "A" quality, and 1s. 3d. for "B." Pitch is strong, at 30s. for prompt delivery; but sellers forward at this price are not in evidence. Carbolic is quiet, at 1s. 9d. Crude tar is quoted at 2d. per gallon.

Sulphate of Ammonia for immediate delivery realizes £11 12s. 6d. per ton; but makers do not seem at all willing to contract forward at this price.

The Price of Gas at Colne.—The Gas Committee of the Colne Local Board have decided to recommend the Board to make a uniform charge of 3s. per 1000 cubic feet for gas. Up to the present, the price has been 2s. 10d. per 1000 feet to large, and 3s. 1d. to small consumers.

The Lancashire Coal Trade.—There has been less activity in the coal trade during the past week; and the advance which marked the opening of the month has not at all been maintained. House-fire coal sells best of the various descriptions; and the better qualities are quoted at 12s. to 12s. 6d. per ton at the pit mouth, with 10s. 6d. and 11s. for seconds, and 9s. to 9s. 6d. for the commoner sorts. Steam coal is in moderate request; and the same remark applies to other sorts. Quotations for steam coal at the pits are 8s. 6d. to 9s.; burgy, 7s. 6d. to 8s.; slack, 6s. 6d. to 7s. per ton; lower descriptions, 5s. Steam coal for shipment averages 10s. 6d. to 11s. per ton, delivered at the Liverpool docks.

Ottoman Gas Company, Limited.—The report of the Directors of this Company for the half year ending June 30 last, which will be presented at the meeting of the shareholders next Tuesday, states that the gas-rental amounts to £7623, and the net profit to £2657. Adding this to the balance brought forward makes the sum of £3242, out of which they recommend that a dividend be paid at the rate of 7 per cent. per annum on both classes of shares, and that £500 be placed to a reserve fund. This will absorb £3125; and leave a balance to carry forward of £117. The shareholders are also informed that Mr. Andrews has retired from the position of Engineer and Manager of the Company's works, after 17 years' good service, and that Mr. John Gandon has been appointed to succeed him. The Directors are happy to say that they retain the services of Mr. Andrews as Consulting Engineer; and they have no doubt that, from his long experience, his continued connection will be of great advantage to the Company.

Gas from Gas-Stoves.—Messrs. Charles Wilson and Sons, of Leeds, have addressed a letter to a Leeds contemporary in reference to the paper read at the meeting of the British Association last Wednesday, by Mr. W. Thompson, on "Flue Gases from Gas-Stoves," a summary of which appears elsewhere in the present issue. They remark that they fear the paper is likely to strike terror into the hearts of thousands of people who, at the present time, are enjoying the comfort and convenience of gas-stoves The word "flue" they understand to refer to that part of a gas-stove which is intended to be connected to a pipe or chimney, in order to carry away any injurious products or unburnt gas, and so prevent their coming into the room in which the stove is used. The tests, as conducted by Mr. Thompson, would be very useful in detecting the wasteful stoves, as the stove emitting the most unburnt gas would be the most extravagant and costly. The tests exhibited do not, they say, prove that gas-stoves are unhealthy; but very plainly show the necessity for the careful fixing of them, to ensure a certain means of carrying the burnt and unburnt gases away. The letter also points out that a coal fire requires the same conditions and care; and Messrs. Wilson have no hesitation in saying that a gas fire or stove, properly fixed, is equally as healthy as a coal fire, more convenient, cleanly, and more economical, when all circumstances are taken into consideration.

The Labour Troubles at Melbourne.—At a meeting of the Australian Strike Fund Council, in the Great Assembly Hall, Mile End Road, last Tuesday night, it was announced that the Gas Workers' Union had contributed £1000 to the fund, and were going to make a special weekly levy of 6d. on the members.——Telegraphic communications from Melbourne states that the Gas Company are now getting a supply of coal from India, and that several of the gas stokers on strike are asking to be re-employed.

The Barnsley Town Council and Electric Lighting.—Upon the minutes of the Park Lighting Committee being submitted at Tuesday's meeting of the Barnsley Town Council, Mr. Bailey took exception to the recommendation of the appointment as Electrical Engineer of Mr. Bromley Holmes during the construction of the electric light plant, and for three months after its completion. He was further proceeding to point out that the Westinghouse Company's tender, which had been accepted, was not the best that might have been adopted, when the Mayor ruled him out of order. Ultimately he moved, and Alderman Marsden seconded, that the appointment of Mr. Holmes be referred back to the Committee. The minutes were then confirmed, subject to the one alluding to Mr. Holmes's appointment being referred back. Mr. Bailey then gave notice that at the next meeting he would move—"That the resolution come to, with respect to accepting the Westinghouse Company's tender, be rescinded."

Sales of Shares.—Last Tuesday, several lots of gas stock and shares were publicly offered for sale at Shipley. Ten per cent. original stock in the *Shipley Gas Company* to the amount of £106 1s. 8d. sold for £256; while another lot of £100 of the same stock realized £245. £128 of 10 per cent. stock in the *North Bierley Gas Company* produced £273; and £22 worth of 7 per cent. shares in the same Company fetched £34 10s.——Last Thursday, some shares in the *Barnsley Gas Company* and the *Denby Dale Gas Company* were sold by auction, at Penistone. Eight £10 "C" shares in the first-named Company sold for £107; and ten £10 "D" shares realized £147. £333 12s. 3d. of capital stock (1852 issue) was disposed of at £450. The shares (£1 fully paid) in the Denby Dale Gas Company, numbering 65, fetched £1 3s., and £1 4s. per share.——At Preston last Thursday, Mr. H. C. Walton offered for sale £6000 of ordinary stock in the *Preston Gas Company* in lots of £100 each. All lots were sold, the competition being brisk; and the prices averaged £153 16s. per lot.

Wigan Corporation Gas Affairs.—At the last meeting of the Wigan County Borough Council, Mr. Jackson asked whether there was any prospect of getting some information from the Gas Investigation Committee. He was informed by Alderman Lamb that there had been some question with Messrs. Holme and King as to the rebuilding of a wall and other work; but this was now in progress. On its completion, the members of the Investigation Committee would be called together to certify that all outstanding matters had been cleared up. An amendment was afterwards proposed by Mr. R. Johnson to the motion for the confirmation of the Gas Committee's proceedings, to the effect that the minute referring to the repair of the street lamps and fittings in the district of the Ince Local Board be expunged. He contended that the Board ought to be allowed to repair the lamps. The Mayor (Mr. Alderman Smith), who is Chairman of the Gas Committee, strongly objected to this course being taken. The Corporation, he said, supplied the gas to the district; and therefore they had more interest than the Local Board in keeping the lamps in a state of repair, and preventing leakage. The amendment was negatived.

Oil v. Gas for Public Lighting at Monmouth.—The question of substituting oil for gas for lighting the streets again came before the Monmouth Town Council on Monday of last week. Mr. Honeyfield put in a complete estimate of the proposed expenditure for oil lighting, which showed that, after purchasing and fixing the lamps, and meeting the expenses of lighting, cleaning, &c., there would still be a small balance in favour of the ratepayers, even in the first year. The Clerk then read a letter signed by the Chairman of the Gas Company, offering to supply gas by meter at 3s. 3d. per 1000 cubic feet, instead of 3s. 6d. as stated at the last meeting. Colonel Walwyn was in favour of gas if they could bring the Company to anything like fair terms; but if petroleum were introduced, electric lighting would be shelved for a long time. Alderman Hyam read a letter from the Town Clerk of Winchester which stated that the streets there had been lighted with oil for some years, and that it gave much satisfaction. There were 460 oil-lamps all the year at a cost of £2 5s. per lamp per annum. In the course of a desultory discussion, several members expressed their regret at being compelled, by the action of the Gas Company, to resort to oil for public lighting; and it was eventually decided to carry out the recommendation of the Special Lighting Committee, to light the streets with petroleum on and after the 1st prox.

The "Organizing Agent" of the Gas Workers' Union on the South Metropolitan Strike.—In the course of an address on Trades Unionism delivered recently at Ashton by Mr. J. W. Gardner, the "Organizing Agent" of the Gas Workers' Union, he put a new complexion on the cause of the strike of the South Metropolitan Gas Company's men. He said that the reason for the strike had been misrepresented. The notices were not given in to defeat the bonus scheme. There had been some friction owing to non-Union men being employed. An agreement was signed to the effect that the stokers should not be compelled to work with non-Union men. It was one of the strongest rules of their Union that they should ask every man employed if he belonged to it; and if he did not, they gave him a chance of joining. If he did not do this, then they refused to work with him. As soon as Mr. Livesey had signed this agreement, he advertised in every local paper in England for men. He (Mr. Gardner) knew that this was so; for he was sent into the country to prevent the blacklegs coming, and he found the advertisement in every place he went to. Mr. Livesey then sent his agents to every hole and corner to recruit agricultural labourers and get ready for the fray. Then he deliberately put on three non-Union men, or they were put on—men who had belonged to the Union, and had forgotten to pay their contribution—and when the Union men challenged them, they said they would not pay. The Unionists then said they should be compelled to leave. Notices were given in; and that was how the strike commenced.

The London Vestries and the Water Question.—As a result of the recent conference of delegates from the various Vestries and District Boards of the Metropolis on the water supply, a suggestion has been sent out to the local authorities that they should unite in giving notice of and preparing a Bill for the purchase of the Water Companies' undertakings, and for power to set up a competing supply, and to ask each Vestry or District Board to contribute £10 towards the preliminary legal and other expenses. It has also been suggested that all the Vestries and District Boards should appoint members of an Executive Committee to prepare the Bill, and do other necessary work.

The Leeds Gas Committee and their Men.—At the recent meeting of the Leeds County Council, as reported in the JOURNAL last week, some allusion was made to a dispute between the Gas Committee and their men with reference to the payment of wages for Bank holidays; and Alderman Gilston stated that the matter was in the hands of the arbitrators, Messrs. Harding and Beckworth. It is asserted that, at the time this statement was made—in fact, so far back as Aug. 30—the decision of the referees had been given, and had been sent to the Corporation. Through some inexplicable delay, it was not brought before the last meeting of the Committee; and it will now in all probability be brought up at the next meeting.

The Proposed Improvement of the Shrewsbury Water Supply.—A special meeting of the Shrewsbury Town Council, which lasted several hours, was held yesterday week, to further consider the report of the Gas and Water Committee, who had made a proposal for laying out a sum of money in the improvement of the present water-works and the supply of water from the Severn (see *ante*, p. 462). Dr. Thursfield, the Medical Officer of Health, reported most favourably as to the excellence of the supply of conduit water, which is used for drinking purposes, and recommended the extension of that supply. As to the river water, he did not favour the expenditure of any large sum of money upon the works. A communication signed by the medical men of the town was also submitted; and in it they condemned, upon sanitary grounds, the taking of the river water from its present source. The report of the Committee was, after much discussion, rejected.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 595.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Apr.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	"	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107—109	..	4 11 9
100,000	20	30 May	8	Bahia, Limited	20	20—22	..	7 5 5
200,000	5	15 May	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	"	7½	Do. New	4	5—5¼	..	5 9 1
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	212—217	..	5 12 11
125,000	"	"	9½	Do. New	100	155—160	..	5 15 7
220,000	20	11 Sept.	11½	Brighton & Hove Original	20	40—42[2]	+1	5 9 6
320,000	20	28 Mar.	11½	British.	20	44—46	+1	4 17 10
50,000	10	11 Sept.	11	Bromley, Ordinary 10 p. c.	10	18—20	+1	5 10 0
39,000	10	"	8	Do. 7 p. c.	10	13—14	+½	5 14 3
328,750	10	13 June	8	Buenos Ayres (New) Limited	10	12½—13½	..	5 18 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	103—106	..	5 13 2
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Apr.	13½	Commercial, Old Stock	100	252—257	..	5 7 0
130,000	"	"	10½	Do. New do.	100	200—205	..	5 4 10
130,000	"	27 June	4½	Do. 4½ p. c. Deb. do.	100	117—122	..	3 13 9
557,320	20	13 June	13	Continental Union, Limited	20	48—50	..	5 4 0
242,680	20	"	13	Do. New '69 & '72	14	33—35	..	5 4 0
200,000	20	"	10	Do. 7 p. c. Pref.	20	39—41	..	4 17 7
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	195—205	..	4 17 7
234,060	10	16 July	—	European, Limited	10	18—20	..	—
120,000	10	"	—	Do. New	10	18—20	..	—
354,060	10	"	—	Do. do.	7½	14—15	..	—
5,470,620	Stck.	14 Aug.	13	Gaslight & Coke, A, Ordinary	100	236—241	..	5 7 10
100,000	"	"	4	Do. B, 4 p. c. max.	100	98—101	..	3 19 3
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	230—235	..	3 18 5
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	119—123	..	4 1 3
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	177—182	..	4 8 5
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	162—167	+1	4 3 10
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
1,061,130	"	13 June	4	Do. 4 p. c. Deb. Stk.	100	115—120	..	3 6 8
294,850	"	"	4½	Do. 4½ p. c. do.	100	123—128	..	3 10 4
650,000	"	"	6	Do. 6 p. c. do.	100	163—168	..	3 11 5
3,800,000	Stck.	15 May	12	Imperial Continental	100	220—223	..	5 7 7
75,000	5	13 June	6	Malta & Mediterranean, Ltd.	5	5—5¼	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	112—114	..	4 7 9
541,920	20	13 June	6¼	Monte Video, Limited	20	19—20	..	6 10 0
150,000	5	30 May	10	Oriental, Limited	5	9—9¼	..	5 5 3
60,000	5	28 Mar.	7	Ottoman, Limited	5	5¼—6	..	5 16 8
166,870	10	16 July	4	Park Limited	10	3¾—4¼	..	8 17 9
420,000	100	2 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
150,000	10	16 Apr.	10	San Paulo, Limited	10	14—15	..	6 13 4
500,000	Stck.	28 Aug.	13½	South Metropolitan, A Stock	100	280—285	..	4 12 11
1,350,000	"	"	11½	Do. B do.	100	226—231	..	4 19 6
141,500	"	"	12	Do. C do.	100	235—245	..	4 17 11
650,000	"	27 June	5	Do. 5 p. c. Deb. Stk.	100	140—145	..	3 9 0
60,000	5	11 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13 *Ex.div.	..	4 8 5
				WATER COMPANIES.				
728,446	Stck.	13 June	9½	Chelsea, Ordinary	100	269—274	+1	3 9 4
1,720,560	Stck.	16 Apr.	7½	East London, Ordinary	100	212—216	..	3 9 5
544,440	"	27 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	−2	3 2 0
700,000	50	13 June	9	Grand Junction	50	120—124	..	3 12 7
708,000	Stck.	14 Aug.	10½	Kent	100	270—275	..	3 16 4
1,043,800	100	27 June	9½	Lambeth, 10 p. c. max.	100	249—254	..	3 14 9
406,200	100	"	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	122—126	..	3 3 6
500,000	100	14 Aug.	12½	New River, New Shares	100	361—366	..	3 6 3
1,000,000	Stck.	31 July	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 6
902,300	Stck.	13 June	6	S'thwk & V'xhall, 10 p. c. max.	100	170—174	..	3 9 0
126,500	100	"	6	Do. 7½ p. c. do.	100	158—163	..	3 13 7
1,155,066	Stck	13 June	10	West Middlesex.	100	265—270	..	3 14 1

The Water Supply in the Plympton Sanitary District.—Certain ratepayers of Plympton St. Mary and Plympton St. Maurice have sent a petition to the Local Government Board against an application by the Plympton Sanitary Authority for power to borrow £6000 to carry out a new water scheme. The grounds of their opposition are that it is an unnecessary and extravagant scheme, and that it is opposed to the expressed desires of the majority of the ratepayers.

The Water Supply of Chester.—The Local Government Board have just issued a report, by Dr. Edward Ballard, one of their Medical Inspectors, on the prevalence of enteric fever during recent years in Chester, and it concludes with certain recommendations, one of which is that steps should be taken to improve and safeguard the water supply of the city "from the dangerous pollution to which there is reason to fear it is now in an increasing degree exposed."

Fatal Gas Explosion at Halifax.—Last Thursday morning, a serious gas explosion, which was attended with fatal results, occurred on the premises of Mr. C. H. Worsnop, who carries on the business of electro-plating in Cheapside, Halifax. The explosion was a severe one; and is attributed to an escape of gas in a room where a gas engine was employed. The building, which was a very old one, was completely shattered; and, what made matters worse, a fire broke out. Seven persons were working on the premises at the time; and four of them were rescued. One other man, named M'Cabe, was picked up unconscious, and taken to the infirmary, where he expired a few hours later. The charred remains of a young woman named Hartley were subsequently found amongst the *débris*, and also the dead body of John Worsnop, the proprietor's younger brother. It was rumoured that a quantity of gunpowder was stored in the building prior to the explosion; but this is emphatically denied by Mr. Worsnop, who avows that there was no gunpowder in the place.

Keswick Gas Company.—The annual meeting of this Company has recently been held. The report submitted stated that the result of the past year's working was a balance to the credit of revenue account of £965, which, with £599 brought from the previous year made the sum of £1565. From this amount the Directors proposed to set aside £60 as a depreciation fund on new mains laid, and cookers, &c., purchased; leaving £1505 available for distribution. They also recommended a dividend at the rate of 8½ per cent. per annum. This, it was mentioned, would absorb £786; and leave £718 to be carried forward to the next accounts. In moving the adoption of the report, the Chairman (Mr. R. Mumberson) pointed out that, although during the twelve months, the price had been reduced, the receipts from the sale of gas were only about £6 below those of 1888-9. The report was adopted, and the dividend recommended declared. The Directors afterwards received sanction to the issue of £1000 additional capital by sale or tender as required. It was also agreed that the Company's old gas-works should be sold, as they have no further use for them. Before the meeting terminated, a vote of thanks was passed to Mr. J. Heywood for his judicious management of the works.

The Electric Lighting Question at Bromley.—At last Tuesday's meeting of the Bromley Local Board, a letter was read from a Mr. H. Podger, asking whether they would be disposed to erect three poles or brackets near the Market Square, on which he might fix three arc lamps of 1200-candle power each for exhibition purposes, and which he offered to maintain for three months free of charge. He added that the overhead wires which would be erected would, in the event of electric lighting being adopted, be placed underground within two years. The letter was referred to a Committee.

Electric Lighting for Bristol.—A Sub-Committee of the Electric Lighting Committee of the Bristol Town Council have, in conjunction with Mr. W. H. Preece, who is advising them professionally, drawn up a long report embodying the results of their investigations, which have been more especially directed to the cost, wear and tear, and the practicability of electric lighting. The Committee conclude that electric lighting at present cannot be supplied as cheaply as gas; yet they are of opinion that it may in the future compete on very fair terms, and they recommend that an installation be established in certain of the principal streets, and that it be in the hands of the Corporation. It is stated that the number of gas-lamps displaced will be 170; and the Sub-Committee are informed that 50 arc lamps of 1200-candle power each will be sufficient for the whole of the district, and that the cost of each lamp will be about £25 per annum.

Lewes Gas Company.—At the half-yearly meeting of the Lewes Gas Company last Wednesday, the report presented stated that the accounts for the six months ending June 30 last showed a profit for the half year of £1398. After providing for interest on mortgages, the balance of net revenue was £1881; and the Directors recommended that a dividend of 5 per cent. be declared, after paying which a balance would remain of £571. The Chairman (Mr. Alderman Kemp), in moving the adoption of the report, made a long statement regarding the public lighting question referred to in these columns last week (p. 566). He said that, in reply to a letter received from the Corporation on the subject, the Directors accepted the conditions, and offered to supply the public lamps with gas by meter. The reason the Board gave notice to terminate the contract for the street lighting was that, by doing so, they were promoting the object the Corporation had in view in writing their letter; and they were informed that they could then take over the lamp-posts at a valuation, if desired. The Company had offered to supply gas to the lamps at 3s. 7d. per 1000 cubic feet—being 3d. less than the charge to private consumers; and it was now for the Corporation to make the next move. With regard to the suggested adoption of the electric light, he said he should be sorry if the town was precipitate and made a mistake, and involved itself in expense which it might, by caution and foresight, have escaped. The motion was seconded and unanimously adopted. After the dividend recommended had been declared, the Manager (Mr. G. Wilson) was complimented on the manner in which the affairs of the Company were conducted.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams:
"GWYNNEGRAM LONDON."

TELEPHONE No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

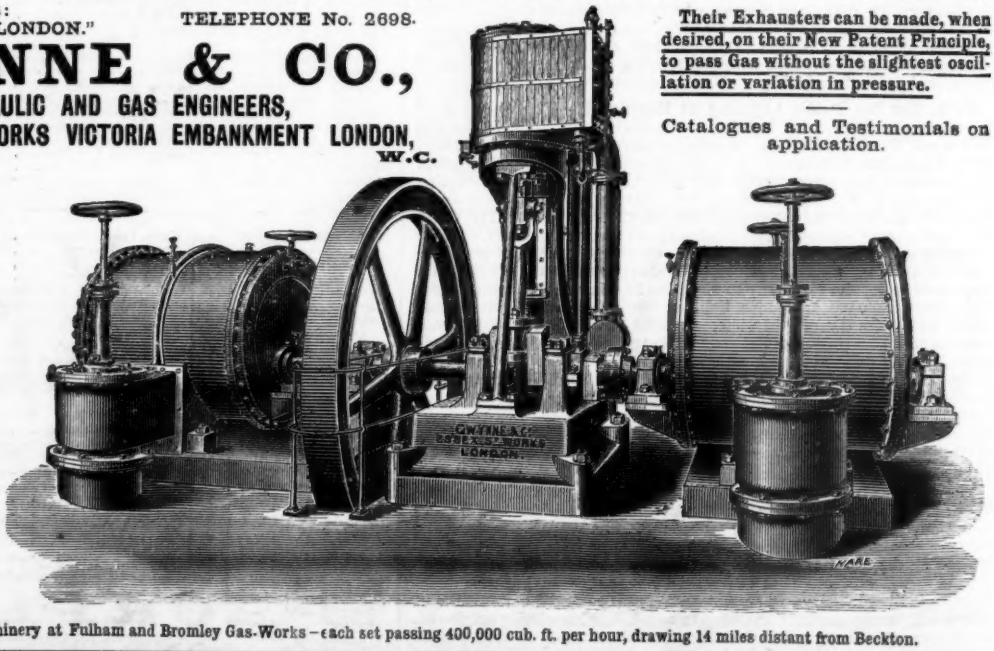
ESSEX STREET WORKS VICTORIA EMBANKMENT LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 29,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAYS.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.

Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c. Tools and Sundries.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house 17, NEWTON STREET, PICCADILLY, MANCHESTER.

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890: Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt, Delivered in carboys or railway tank waggons.

For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street, LONDON.

ADVERTISER (aged 28) desires an appointment as SECRETARY or ACCOUNTANT to a Gas Company. Home or Colonies. Eight years in present post. First-class Accountant. Highest References.

Address No. 1855, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER, aged 27, desires Situation as COLLECTOR, METER INSPECTOR, or ASSISTANT MANAGER. Competent Bookkeeper. Excellent testimonials, showing nine years' irreproachable character. Moderate salary.

Apply to H., care of Mr. Ward, 214, Longford Street, WARRINGTON.

SITUATION Wanted, by the Advertiser, as SECRETARY or ASSISTANT MANAGER of Gas-Works. Abroad preferred. Has managed small Works for some years. Analyst. Aged 30. First-class testimonials and references.

Address No. 1857, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ERECTION OF TAR PLANT.

A GAS ENGINEER (Member of The Gas Institute) having had considerable experience in the ERECTION OF PLANT for the FRACTIONAL DISTILLATION and RECTIFICATION OF COAL TAR, is now prepared to undertake such erection for Gas-Works, and also give Instructions to Work the same when complete.

Letters to be addressed to No. 1856, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 584 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.

Telegraphic Address: "Braddock, Oldham."

TAR and Liquor wanted. BROTHERTON AND CO., Commercial Buildings, LEEDS.

WANTED, a steady young Man, used to reading Meter Indices, as ASSISTANT INSPECTOR OF METERS. Wages 25s. per week.

Apply, by letter, to No. 1859, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an active Man as Stoker. Must have had some experience; and be able to lay Services and connect Meters. References required. Wages, 25s. per week.

Apply, stating age, &c., to the MANAGER of the Gas-Works, LEATHERHEAD.

WANTED, a Man as Gas-Fitter and MAIN and SERVICE LAYER; also to repair Stokers' Tools. Constant employment to a steady, suitable Man. Reference required. Wages 24s. per week.

Apply to J. W. PORTASS, Manager of the Gas-Works, BISHOP'S STORTFORD.

WANTED, a Retort-House Stoker. Must be accustomed to Shovel Charging; and preference will be given to one able to take charge of Engine and Exhauster. Constant employment for a steady Man.

Apply, by letter, stating age and wages required, and giving reference, to W. D. CHILD, Manager, Gas-Works, Romford, ESSEX.

MANAGEMENT OF GAS-LAMP BUSINESS.

WANTED, an experienced Gentleman to undertake, from the commencement, the MANAGEMENT of a BUSINESS for the introduction of a New REGENERATIVE GAS-LAMP. Must have considerable knowledge of the trade. State experience and terms.

Address DIEMEL LIGHT COMPANY, LIMITED, care of Steadman, Van Praagh, and Sims, Solicitors, 23, OLD BROAD STREET, E.C.

A NEW HIGH-POWER GAS-LAMP.

ARRANGEMENTS are about to be made for the INTRODUCTION to the English market of a well-tried and most successful high-power REGENERATIVE GAS-LAMP of Foreign Manufacture. Liberal terms will be conceded to persons willing to take either the sole agency for the sale of the Lamp in the United Kingdom, or for any specially selected district.

Address (in confidence) No. 1858, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.

JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 616.

Inquiries should be addressed to THE AUTOMATIC COAL-GAS COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

SULPHURIC ACID delivered in Manufacturers' Tanks or Carboys.

Prices on application to HARDMAN and Co., Miles Platting, MANCHESTER.

WANTED, to purchase Gas Carbon, delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.

Address, stating price per ton and quantity, No. 1766, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR IMMEDIATE SALE—A small GAS PLANT, for private use. To be seen, fixed complete, in the neighbourhood of Warrington.

Apply, by letter, to No. 1852, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Hornsey Gas Company have for SALE Two Cast-Iron TOWER SCRUBBERS—one 7 ft. 6 in. diameter by 30 feet high, and the other 10 feet diameter by 40 feet high—in good condition.

Full particulars can be obtained at the GAS-WORKS, Clarendon Road, HORNSEY, N.

FOR SALE—One Single Gasholder, 80 feet diameter by 20 feet deep, ten Cast-Iron Columns and Wrought-Iron Girders.

Also four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep; 12-inch Centre-Valve and Connections.

Would erect the above, and make practically equal to new.

Inquiries invited for various second-hand Gas Plant—Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.

Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

THE Directors of the Ashford (Kent) Gas and Coke Company, Limited, invite TENDERS for the purchase of the surplus TAR produced on their Works for One year, commencing Nov. 1, 1890.

The Tar will be delivered into Trucks on the Company's Siding, S.E.R.; the Contractor supplying the necessary Barrels or Tanks for it.

The Directors do not bind themselves to accept the highest or any tender.

Tenders must be delivered at my Office not later than Oct. 4.

F. HUGHES-HALLETT, Secretary.

Ashford, Sept. 10, 1890.

C. & W. WALKER.

GASHOLDERS; PURIFIERS; PURIFYING MACHINES;

CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;

SULPHATE & SULPHUR PLANT;

RETORT MOUTHPIECES; CONDENSERS;

LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;

SLIDE VALVES; TAR BURNERS; &C. &C.

WOOD SIEVES.

ADDRESSES: 8, Finsbury Circus, London, E.C.; Midland Iron-Works, Donnington, near Newport, Shropshire.

"FORTRESS LONDON." "FORTRESS DONNINGTON."—Telegraphic.

HOLMSIDE GAS COALS.

THE Owners of Holmside and South Moor Collieries possess an undivided area of nearly 5000 acres of COAL in the County of Durham, over the greater portion of which area the most of the best Coal of the district, including the well-known Hutton Seam, remains almost untouched; and as preparations are being made for working the Hutton Seam on a large scale, it is expected that the reputation of HOLMSIDE GAS COALS will be still further increased. The Holmside and South Moor Collieries have been in the hands of the same families for over half a century; but, until lately, no adequate attempt has been made to open out their very large Coal-Field, notwithstanding that the best Coal of the district around them, and especially the Hutton Seam, has been for some time past seriously diminished by reason of the vigorous workings of neighbouring coal-owners. Holmside Gas Coals are now being worked out of Holmside and South Moor Collieries at a rate of about 2200 tons per working day—a rate totally inadequate to meet the existing demand. By an extensive development of workings in the Hutton Seam, it is hoped that the demand may be fully met, and the quality raised to the highest point attainable by Durham Coal.

For price and particulars, apply to MARK ARCHER, Holmside and South Moor Offices, Quayside, NEWCASTLE-ON-TYNE.

TENDERS FOR GAS COAL.

THE Gas Committee of the Corporation of Stratford-upon-Avon invite OFFERS of GAS COAL.

Full particulars and forms of tender can be obtained upon application to

J. S. CRANMER,
Manager and Secretary.

Sept. 9, 1890.

BOROUGH OF DARWEN.

SULPHURIC ACID.

THE Gas Committee are prepared to receive TENDERS for 100 tons of SULPHURIC ACID, to be delivered in Railway Tanks during the next Twelve months.

Tenders, endorsed "Sulphuric Acid," to be sent to C. Costeker, Esq., Town Clerk, Darwen, on or before Thursday, the 18th inst.; but full particulars of the kind, quality, and strength to be previously sent to

THOS. DUXBURY,
Manager.

Gas-Works, Darwen, Sept. 5, 1890.

BOROUGH OF BURTON-UPON-TRENT.

OXIDE OF IRON.

THE Gas and Electric Light Committee of the Burton-upon-Trent Corporation are prepared to receive TENDERS for the supply of from 200 to 250 tons of OXIDE OF IRON for Gas Purification, to be delivered in Railway Company's Trucks at the Gas-Works Railway Siding, Burton-upon-Trent, in such quantities and at such times as may be directed by their Manager.

Persons tendering are requested to state whether the Oxide they offer is a Natural or Artificial one.

Terms of payment: Net cash, monthly.

Tenders, enclosed in an envelope, and endorsed "Tender for Oxide of Iron," are to be delivered to the undersigned at or before Ten a.m., on Wednesday, the 24th of September inst.

The Committee reserve to themselves the right of rejecting the lowest or any tender.

F. L. RAMSDEN,
Manager and Engineer.

Gas-Works, Burton-upon-Trent,
Sept. 5, 1890.

HARTLEPOOL GAS AND WATER COMPANY.

TO IRONFOUNDERS, ETC.

THE Directors of the above Company are prepared to receive TENDERS for the several Works and Materials required in the construction of a WATER-TANK, 17 ft. 9 in. in height, and 60 feet square, internal measurement, together with built and rolled GIRDERS for supporting the same on Tower of Masonry 82 ft. 8 in. in height; also CAST-IRON COLUMNS, INLET, OUTLET, and OVERFLOW PIPES, STRUTS, STAYS, BOLTS, &c., &c., and a WROUGHT-IRON ROOF, 60 feet span, covered with Corrugated Iron.

Plans and Specification may be seen, or any further information obtained, on application to the Company's Engineer, Mr. Thomas Bower, who, if desired, will supply copies of the plans.

Tenders on form prescribed, and sealed and endorsed "Tender for Water-Tank," to be sent to Mr. Thomas Trewhitt, Secretary, Gas and Water Company, West Hartlepool, not later than Wednesday, the 1st day of October next.

The Directors do not bind themselves to accept the lowest or any tender.

By order of the Directors,
THOMAS TREWHITT, Secretary.

Gas and Water Company's Offices,
West Hartlepool, August, 1890.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Directors of the Wakefield Gas-light Company are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works for One year, commencing the 1st of September next.

Estimated production: Tar, 1300 tons; Ammoniacal Liquor, 3500 tons.

The Liquor to be tested by what is known as Wills's Test.

Tenders, properly endorsed, to be sent in on or before Saturday, the 20th inst.

By order,
JOHN W. WHITAKER,
Secretary and Manager.

Gas Offices, Sept. 8, 1890.

BOROUGH OF HEYWOOD.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Heywood Gas Committee are pre-pared to receive TENDERS for the Surplus TAR produced at their Works during the ensuing year, and also for the supply of SULPHURIC ACID, suitable for the Manufacture of Sulphate of Ammonia, during the same period.

Particulars and forms of tender may be obtained on application to the Manager, Mr. W. Whatmough.

Sealed tenders, marked "Tar," or "Sulphuric Acid," as the case may be, to be sent to me not later than Tuesday, the 16th of September inst.

By order,
ALFRED WALLIS, Town Clerk.

Municipal Buildings, Heywood,
Sept. 4, 1890.

SUTTON-IN-ASHFIELD LOCAL BOARD.
(GAS DEPARTMENT.)

SUPPLY OF GAS COAL.

THE Gas Committee of the above Local Board are prepared to receive TENDERS for the supply of 1100 tons of well-screened GAS COAL, to be free from Shale and Pyrites, and to be delivered at the Railway Station, Sutton, in such quantities as the Manager shall from time to time direct, between Jan. 1, and June 30, 1891.

Particulars may be obtained on application to the Manager at the Gas-Works, Sutton-in-Ashfield, Notts.

Tenders, stating price, to be addressed as above, and marked "Tender for Coal," so as to arrive not later than Tuesday, the 30th of September, 1890.

By order,
G. H. HIBBERT,
Clerk to the Committee.

Local Board Offices. Sutton-in-Ashfield, Notts.

ROCHDALE CORPORATION.

TO IRONFOUNDERS AND OTHERS.

THE Gas Committee of the Corporation invite TENDERS for the supply of about 500 yards each of 2-inch, 3-inch, and 4-inch CAST-IRON GAS-MAINS, turned and bored joints, and coated with Dr. Smith's Solution. Also for supplying about 40 yards of 6-inch and 120 yards of 4-inch CAST-IRON, STEAM-PIPING, in 9-feet lengths, with faced Flanges, together with the necessary TEES and BENDS.

Any further information may be obtained on application to Mr. T. Banbury Ball, the Manager, at the Gas-Works.

Tenders, stating price per ton delivered at the Gas-Works, must be sent in to me not later than Noon on Wednesday, Sept. 24, 1890.

By order,
ZACH. MELLOR, Town Clerk.

Town Hall, Rochdale,
Sept. 12, 1890.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors of the above Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations during a period of One, Two, or Three years, commencing on the 1st day of January, 1891.

The Annual Quantities of Tar produced at each of the Stations at present are approximately as follows:—

Avon Street	330,000 gallons.
Canons' Marsh	490,000 ,,
Stapleton	550,000 ,,

Further particulars, with forms of tender, may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Tar," must be delivered not later than Ten a.m., on Monday, the 3rd day of November.

JAS. V. GREEN, Secretary.

Gaslight Offices, Canons' Marsh,
Bristol, Sept. 10, 1890.

TENDERS FOR TAR.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the purchase of the surplus TAR they will have for disposal during the Twelve months ending Sept. 30, 1891—namely about 1800 tons—to be divided into Three Contracts of 600 tons each.

The Company will probably dispose of the total surplus of approximately 1800 tons in One, Two, or Three Contracts as the Board may decide; but they do not bind themselves to accept the highest or other Tender or Tenders.

Tenders must be addressed to the Chairman of the Finance Committee of the Derby Gaslight and Coke Company, Friar Gate, Derby, endorsed "Tender for Tar," and delivered on or before Tuesday, the 23rd day of September, 1890.

Further particulars may be had on application.

By order of the Directors,
RICHARD FISHER,
Secretary.

Derby Gas Office, Sept. 4, 1890.

FENTON URBAN SANITARY DISTRICT.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of 3000 tons of good GAS BURGY, to be delivered at their Works, commencing from the 1st of January next.

For further particulars apply to the Manager.

Tenders to be sealed, and endorsed "Tender for Coal," and to be addressed to the Chairman, Gas-Works, Fenton, on or before Tuesday, the 23rd inst.

F. H. DARWIN,
Manager and Engineer.

Gas Offices, Fenton, Aug. 20, 1890.

BRIERLEY HILL DISTRICT GASLIGHT COMPANY.

THE Directors of this Company are pre-pared to receive TENDERS for the surplus TAR for One year ending Sept. 30, 1891, made at their Brierley Hill and Kingswinford Works, delivered into Boats at the former place in One hour, and the latter place in Twelve hours.

Tenders to be sent in to me not later than Oct. 4 next.

The Board do not bind themselves to accept the highest or any tender.

HENRY M. JACKSON, Secretary.

Board-Room, Gas-Works, Brierley Hill,
Sept. 10, 1890.

COMMERCIAL GAS COMPANY.

NOTICE is hereby given that an ORDINARY MEETING OF THE COMMERCIAL GAS COMPANY will be holden at the Cannon Street Hotel, in the City of London, on Friday, the 3rd of October, 1890, at Twelve o'clock at Noon—

To receive the Report of the Directors,
To declare a Dividend,
And for other Business.

The Stock Transfer Books will be closed from the 20th of September inst. to the 3rd of October next, both Days inclusive.

By order of the Board,
H. D. ELLIS, Secretary.

Offices: Stepney, Sept. 12, 1890.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is hereby given that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 24th inst., at half-past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and one Auditor in the place of those who go out by rotation, but who are eligible to be re-elected.

Notice is hereby also given, that the Transfer Books of the Company will be closed on the 18th inst., and re-opened on the 25th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 3, 1890.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

THE Committee request those desirous of ADVERTISING in the ANNUAL REPORT OF PROCEEDINGS, 1890, to apply for space to the Secretary.

Rates: Full Pages, 21s.; Half-Page, 12s. 6d.

Priority of insertion will be given according to the order in which applications are received.

ROBT. S. CARLOW, Secretary.

CORPORATION GAS-WORKS, ARBROATH,
Sept. 6, 1890.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 23, Great George Street, WESTMINSTER.

Fcap. 4to, Cloth, Gilt Lettered, numerous Illustrations, price 7s. 6d., post free.

Practical Photometry:

A GUIDE TO THE STUDY OF THE

MEASUREMENT OF LIGHT.

By William Joseph Dibdin, F.I.C., F.C.S.,

Chemist and Superintending Gas Examiner to the London County Council,

Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

London: WALTER KING, 11, Bolt Court, FLEET ST., E.C.

Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

Price 6s., Cloth Bound, Bevelled Boards,

THE

GUIDE-FRAMING OF GASHOLDERS

AND OTHER PAPERS

CHIEFLY RELATING TO

STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.

BY

F. SOUTHWELL CRIPPS, Assoc. M. Inst. C.E.

Reprinted from the JOURNAL OF GAS LIGHTING. *Fully Revised and Corrected by the Author, with many Additions.*

LONDON:

WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

PREPARED OXIDE OF IRON

FOR PURIFYING COAL GAS.

As extensively used in Yorkshire, Lancashire, the Midlands, and Abroad.

Manufacturers: BAILES & HALLSWORTH,

Armley, Leeds, & at Bradford, Manchester.

PATENTS FOR INVENTIONS,

REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

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Yield of Gas per Ton, over 12,000 Cubic Feet.
Illuminating Power - - - - - 26 Candles.
Coke per Ton, - - - - - - - 57 per cent. of a quality almost equal to that made from the best Coking Coal.

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SOOTHILL WOOD COLLIERY,

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Prices and Analysis on application.

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Is Weck's Patent arrangement of Three-Way Disc Valves, either separate for Purifiers fixed in line, or arranged together as a

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When the Purifiers are fixed in square.

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DESCRIPTIVE PAMPHLET ON APPLICATION.

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

A WARM BATH IN TEN MINUTES.

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NO CONTACT OF GAS WITH WATER.

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Manufacture and keep in Stock at their Works (also large stock in London)

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SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

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GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

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GAS COAL
In Reserve.

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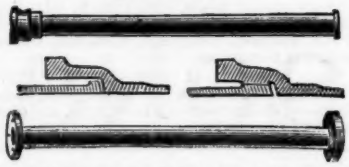
1¼ to 12 IN. BORE.



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A neat and effective apparatus to remove Tar from the Hydraulic Main and ensure a light Liquor Seal.
300 Sets in successful operation.

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This System is being largely adopted at several places on the Continent and in America, and at various Gas-Works in England—notably at the Works of The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Brentford Gas Company.

For Illustrated Description, see Advt. p. 516.

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ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

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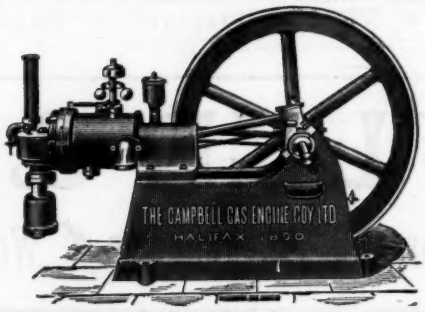
PERFECT SIMPLICITY OF CONSTRUCTION.

Thorough Economy in Working.



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Latest Improvements.

Give unequalled results.

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STOCKTON-ON-TEES
ASHMORE BENSON PEASE & Co
SIMPLE IN CONSTRUCTION EFFECTIVE IN RESULTS
SULPHATE PLANT
DAVIS PATENT
ECONOMICAL IN COST & SPACE
STILLS IN STOCK 2 3 & 4 FEET DIAM.
MAKERS OF ALL GAS PLANT &
Every kind of Constructional Ironwork
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for Guiding Gasholders. Effecting a Saving of 25 per cent in Cost

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Is prepared to give Estimates for, and undertake the erection of,

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Competent Engineers are sent out to advise as to the best means of application.

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THE BEST KNOWN PRESERVATIVE FOR IRONWORK.

Sold in large quantities on better terms than can be obtained from any other manufacturer.

Also sold in powder in 1 cwt. kegs, at 7/6 per cwt.

In oil as a paste ready for mixing, at 25/- per cwt.

As a paint ready mixed for use, at 3/9 per gallon, in 5-gallon cans, or in packages to suit buyers.

INQUIRIES SOLICITED.

Boiler Incrustation Prevented

BY USING

Used at the following Gas-Works:—Ascot, Birmingham, Broadstairs, Bromsgrove, Hendon, Leven, N.B., Pembroke, Seaham Harbour, Stamford, Warwick, &c., &c.; and by leading Engineers throughout the country.

Absolutely harmless, and the most economical means of preventing Incrustation obtainable.

TESTIMONIALS ON APPLICATION.

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THE CHEAPEST AND BEST LAMP IN THE MARKET.

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ONE WORKS HAS 96 OF THESE LAMPS FIXED AND GIVING SATISFACTION.

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THE VERY

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For those Firms desirous of securing a large business, the acquisition of these Patents would practically give a monopoly of the Gasholder Trade in the above Countries.

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TANK CONSTRUCTION MUCH CHEAPER AND EASIER.

Large saving in Carriage, Freight, Haulage, and Insurance.

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Engineers, Ironfounders, & Contractors,

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FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **160** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

Advantages attending its use are:—

INCREASED VOLUME of GAS per TON, and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

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MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by WIRE ROPE, STEAM, or COMPRESSED AIR.—The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

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N.B.—The whole of these Fittings are made of Wrought Iron.

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These Cannels will rank with the Australian Shale for Gas Manufacture.

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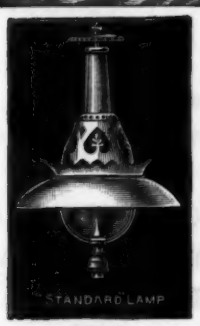

ITS ADVANTAGES ARE:

IMMENSE ECONOMY IN THE CONSUMPTION OF GAS.

INTENSITY, PURITY, AND STEADINESS OF THE LIGHT.

Absence of Downward Shadow. *Practical Completeness of Combustion.*

CAN BE FITTED TO ORDINARY SUPPLY-PIPES WITHOUT ALTERATION.

CAN BE USED AS VENTILATING LIGHTS, whereby the products are removed, and damage to decorations, &c., prevented.

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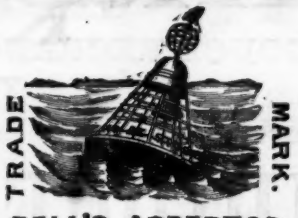

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IS MADE READY FOR USE.

IS FIRE RESISTING.
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IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

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Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

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Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

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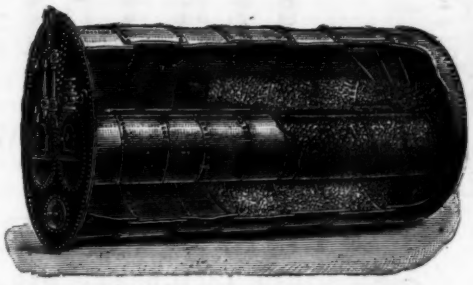
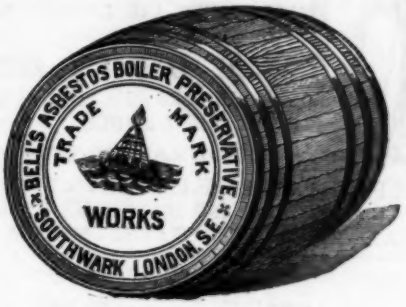
BELL'S ASBESTOS BOILER PRESERVATIVE

Will remove Incrustation from Steam-Boilers of all kinds without chipping.



A shows Boiler Plates when incrusted.
B shows Boiler Plates when cleaned by this Composition.



Every Cask is sent out as above.

The action of this **BOILER PRESERVATIVE,** by absorbing the free oxygen that is in the water, **entirely checks pitting and corrosion.** It also disintegrates incrustation so immediately as to prevent its adhering to the plates; and the deposit falls to the bottom in a loose powder, which is easily swept out. By keeping boilers clean, a **great economy of fuel is effected,** and the danger of the plates burning is entirely obviated; thus avoiding the great risks which are inseparable from scaled plates, lengthening the life of a boiler, and **covering its own cost a hundredfold.** Whenever possible it should be used through Feed Pump or Injector, which it will also keep clear from incrustation. The small quantity required to effect its purpose makes this the most economical, and more than repays the higher price we charge for a fluid which, in the case of many other makers, is useless.

QUANTITY REQUIRED. A quarter of a pint weekly per horse power indicated; where the water is very bad rather more, or one pint for every 700 gallons of water evaporated.

BELL'S ASBESTOS CO., Ld.

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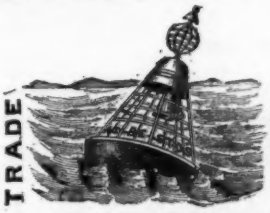

DEPÔTS.
AMSTERDAM: 264 N. Z. Voorburgwal,
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AGENTS.
BIRMINGHAM: BELL and Co., 7, John Bright Street.
CARDIFF: BELL and Co., West Bute St.

SOUTHWARK, BELL'S ASBESTOS. **LONDON, S.E.**

BELLS ASBESTOS
YARN AND SOAPSTONE PACKING
Is the BEST LOCOMOTIVE PACKING made.

BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
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BELL'S ASBESTOS LUBRICANT
Is unequalled
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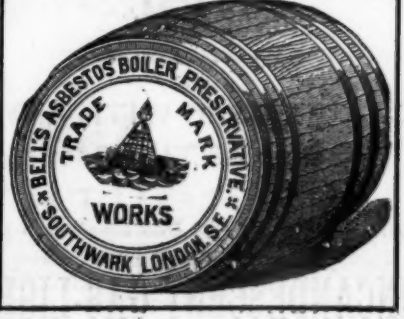

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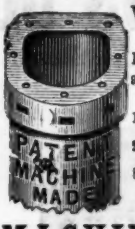

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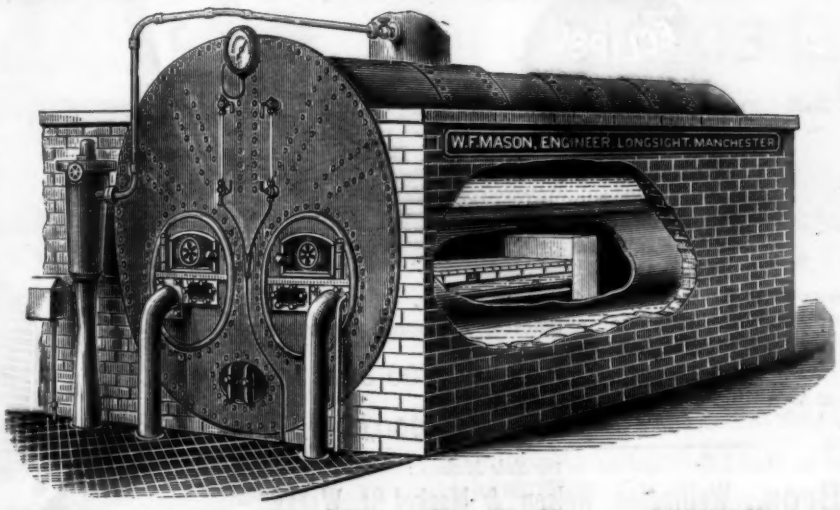

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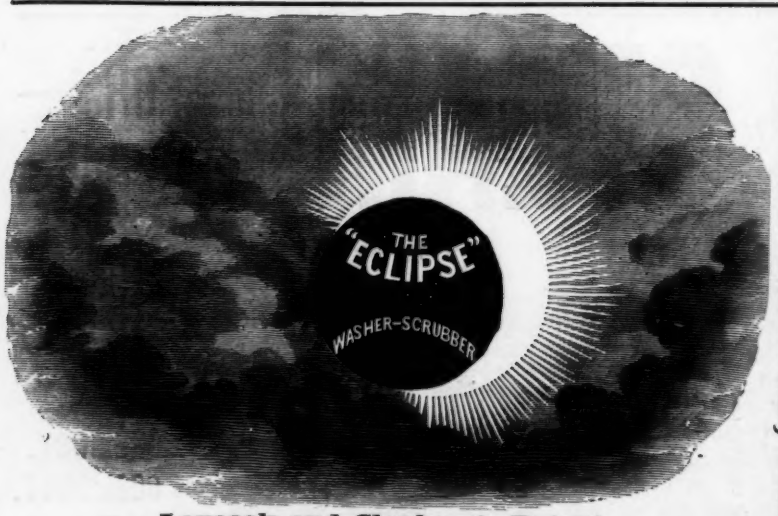

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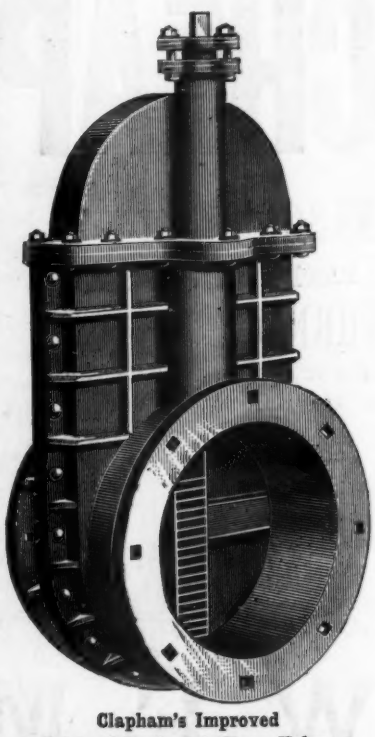

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